United States Department of Agriculture
Natural Resources Conservation Service

Bear-Wyaconda Sub-basin

HUC # 07110001

R A P I D W A T E R S H E D A S S E S S M E N T

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A rapid watershed assessment (RWA) evaluates resource conditions and needs on an 8-digit hydrologic unit (HU) basis. The assessment identifies the primary resource concerns for the watershed being profiled and provides estimate as to where conservation investments would best address the concerns of landowners, conservation districts, stakeholders, and others. The RWA provides information on which to base decisions about conservation priorities, allocation of resources, and funding for implementation.

Introduction[1]

Rapid watershed assessments (RWAs) provide initial estimates of where conservation investments would best address the concerns of land owners, conservation districts and other stakeholders within drainage sub-basins. These assessments are designed as quick looks over large drainage areas to provide a starting point for area-wide, watershed or site-specific planning. Missouri has 66 sub-basins averaging 628,000 acres in size.

RWAs contain two parts: a resource profile based on readily available resource information and an assessment matrix of current and future resource conditions and related installation and maintenance costs. The resource profiles provide a general description of the location and primary physical attributes of the sub-basin; known resource concerns; and selected agricultural and socio-economic characteristics. The assessment matrices contain condition tables detailing the current level of conservation in the sub-basin; future considerations tables identifying appropriate suites of conservation practices needed to deal with the primary resource concerns for each major land use; and summary tables that summarize the various costs associated with the Resource Management Systems (RMS) identified in the future considerations tables.

The Bear-Wyaconda sub-basin is a mainstem hydrologic unit on the upper Mississippi River, taking in a drainage area of 1,101,000 acres (1,720 square miles). The sub-basin extends from the Des Moines River's outlet on the Mississippi River just below Keokuk, Iowa to the Fabius River confluence with the Mississippi River just below Quincy, Illinois. The sub-basin's eastern boundary is set by the Bear Creek watershed, draining 382,800 acres (598 square miles) covering portions of Adams and Hancock counties. The Illinois portion of the sub-basin constitutes 34% of the sub-basin's total land area. The sub-basin's western boundary is formed by the Fox River, Wyaconda River and Honey Creek watersheds draining 502,700 acres (785 square miles) in Missouri through portions of Clark, Lewis, Scotland and Marion counties and 215,500 acres (337 square miles) in Iowa through portions of Davis, Van Buren and Appanoose counties.

From west to east, the sub-basin transitions through five primary physiographic landscapes. On the far west, flat to gently rolling drainage divides with thin loess over glacial till give way to gently sloping and moderately dissected valleys along the Fox and Wyaconda Rivers. The glacial till thins and loess deepens as one moves closer to the Mississippi River. The sub-basin is divided by the heavily modified alluvial plain and main channel of the Mississippi River, flanked on both sides by rugged hills, bluffs and ravines. These river hills are underlain by limestone and sandstone and deeply covered by loess. The alluvial plain's soils, derived from deep, silty and clayey alluvium, are poorly drained. On the Illinois side, the flanking river hills give way to a well dissected till plain with broad, nearly level interfluves.

The sub-basin is still predominantly rural in character with only 4 percent (41,000 acres) of its land area dedicated to developed uses. Fifty-three percent (584, 900 acres) of the sub-basin is cropped, and 18 percent (204,200 acres) is grazed. Eight percent (81,900 acres) is in CRP and ungrazed forest covers 13 percent (143,600 acres) of the sub-basin. Minor land (9,800 acres), water (29,100 acres) and federal land (6,500 acres) together account for about 4 percent of the Bear-Wyaconda's total land area. Cattle, followed by hogs and pigs, sheep, poultry and horses are the dominant livestock types.

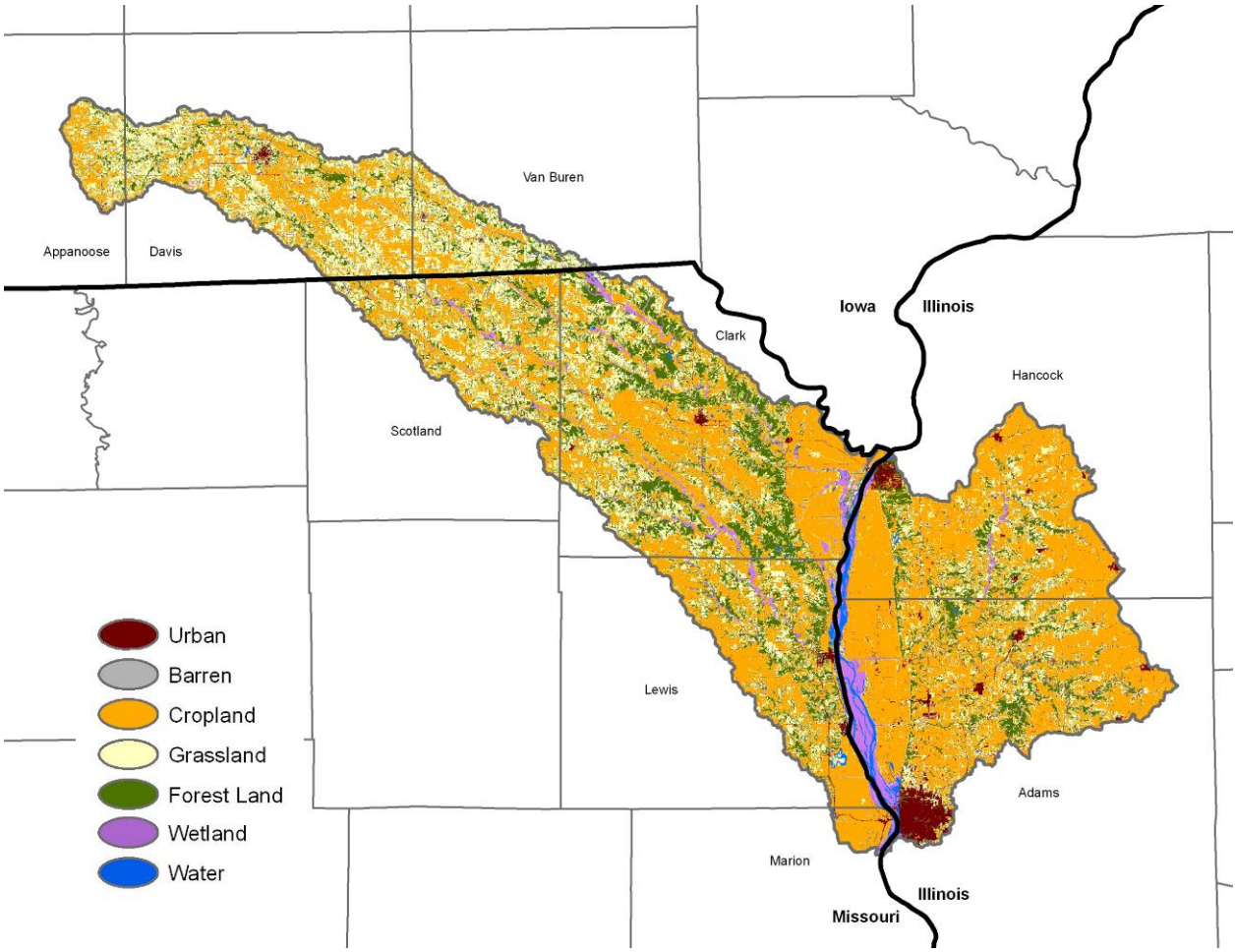
Figure 1

Sub-basin Primary Land Cover/Use Percentages By State					
State	Cultivated Cropland	Non-Cultivated Cropland	Pasture Land	Forested Land	Developed Land
Missouri	19%	3%	6%	11%	1%
Illinois	23%	1%	3%	3%	2%
Iowa	6%	1%	5%	3%	1%
Sub-basin Total	48%	5%	14%	17%	4%

Physical Description

A. Land Use/ Land Cover[2]

Figure 2



Land Use/ Land Cover NRI	Urban	Cultivated cropland	Conservation Reserve Program	Non-cultivated cropland	Pastureland	Forest land	Minor land cover/uses	Water	Federal land cover/use not recorded
1982 Acres	35,000	590,900	NA	46,000	214,100	170,000	11,000	28,400	5,600
1987 Acres	38,600	577,500	21,600	57,100	186,500	177,500	10,400	29,100	5,600
1992 Acres	39,100	520,100	88,900	57,600	168,900	180,000	10,800	29,200	6,500
1997 Acres	41,000	528,400	81,900	56,500	157,700	190,100	9,800	29,100	6,500
Five Year trend 92-97	**Up 5%**	**Up 2%**	**Down 8%**	**Down 2%**	**Down 7%**	**Up 6%**	**Down 9%**	**Down 0.003%**	**No change**
Ten year trend 87-97	**Up 6%**	**Down 9%**	**Up 279%**	**Down 1%**	**Down 15%**	**Up 7%**	**Down 6%**	**Up 0.003%**	**Up 16%**
Fifteen year trend 82–97	**Up 17%**	**Down 11%**	**Up 23%**	**NA**	**Down 26%**	**Up 12%**	**Down 11%**	**Up 2%**	**Up 16%**

Land Cover / Land Use Definitions

- Urban – This map category corresponds to the tabled category called Developed Land. Developed Land is a combination of the NRI land cover/use categories large urban and built-up areas, small lbuilt-up areas and rural transportation land. Rural transportation land consists of all highways, roads, railroads and associated right-of-ways outside urban and built-up areas and also includes private roads to farmsteads, logging roads and other private roads.

- Barren – This map category is typically, the surface of sand, rock or exposed soil with less than 5 percent vegetative cover. Barren land acreage is included in the tabled NRI Minor Land category. Minor land is a miscellaneous grouping of land covers and uses that includes farmsteads and farm structures, field windbreaks, and barren land.

- Cropland – This map category most closely corresponds to the tabled category called Cultivated Cropland. Cultivated Cropland comprises land in row crops, close-grown crops and hayland or pastureland in rotation with row or close-grown crops.

- Grassland – This map category includes 4 tabled NRI land cover/use categories:
  Non-cultivated cropland; Conservation Reserve Program (CRP) lands; Pastureland; Rangland. on-cultivated cropland includes permanent hayland and horticultural cropland. The CRP is a federal program established under the 1985 Food Security Act to convert highly erodible cropland to vegetative cover (primarily grass) under 10 year contracts. Pastureland is land managed primarily for the production of introduced forage plants for livestock grazing. Rangeland is land on which the climax or potential plant cover is composed principally of native grasses, grass-like plants, forbs or shrubs suitable for grazing and browsing and introduced forage species that are managed like rangeland.

- Forestland and Woodland – A majority of the acreage for these map categories is captured by the tabled NRI Forestland category, defined as land that is at least 10 percent stocked by single-stemmed woody species of any size that will be at least 4 meters tall a maturity. Ten percent stocked, equates to an areal canopy cover of 25 percent or greater.

- Wetlands – Acreage for this mapped category is not reflected in any of the NRI tabled acreage estimates. The wetland map category is a combination of satellite derived wetland classes, National Wetland Inventory (NWI) acres and Wetland Reserve Program (WRP) acres. (See Wetlands Section for NWI acreage estimates)

- Water – This map category closely corresponds to the NRI table acreage estimate representing water bodies and streams that are permanent open water.

B. Grassland[2]

	Rangeland (acres)			Pastureland (acres)			Grazed Forest Land (acres)		
State	Total in Sub-basin	Percent of sub-basin	Percent of state land use total	Total in Sub-basin	Percent of sub-basin	Percent of state land use total	Total in Sub-basin	Percent of sub-basin	Percent of state land use total
Illinois	0	0	0%	31,600	20%	3%	7,300	16%	1%
Iowa	0	0	0	60,000	38%	5%	15,300	33%	1%
Missouri	0	0	0%	66,100	42%	6%	23,900	44%	8%
Sub-basin Totals	0	0	0%	157,700	100%	-	46,500	100%	-

C. Crop History[2]

	Close Grown Crops (acres)		Row Crops (acres)			Hayland (acres)		
State	Oats	Wheat	Corn	Sorghum	Soybeans	Grass	Legume	Grass-Legume
Illinois	0	17,000	129,200	0	93,500	0	5,500	11,000
Iowa	1,600	1,600	17,900	0	34,800	5,200	4,000	9,700
Missouri	0	9,800	85,200	0	119,100	23,700	0	13,000
Sub-basin Totals	1,600	28,400	232,300	0	247,700	28,900	9,500	33,700

D. Public Land[3,33]

About 8,833 acres or 1.3% of the sub-basin are in public ownership in Iowa and Missouri. Comparable ownership data were not available for Illinois. These public lands include 10 conservation or wildlife management areas, 5 river accesses, 7 city/county parks, 1 state park, 1 natural area and 1 historic site. Public ownership in this region is below Missouri's state average of 6.7%.

Figure 3

Public Land Ownership (acres)					
	Missouri Department of Conservation	Missouri Department of Natural Resources	Davis County, Iowa	Iowa Department of Natural Resources	Other
Total Acres	5,979	1,106	296	1,070	382

E. Soil Capability

Land Capability[2]

Land Capability is a classification system used to identify the erosion potential of farmland. For over forty years the USDA has used land capability classification as a planning tool in laying out conservation measures and practices to farm without serious deterioration from erosion or other causes. The current system includes eight classes of land designated by Roman numerals I through VIII. The first four classes are arable land--suitable for cropland--in which the limitations and the need for conservation measures and management increase from I through IV. The remaining four classes, V through VIII, are not to be used for cropland, but may have uses for pasture, range, woodland, grazing, wildlife, recreation, and aesthetic purposes.

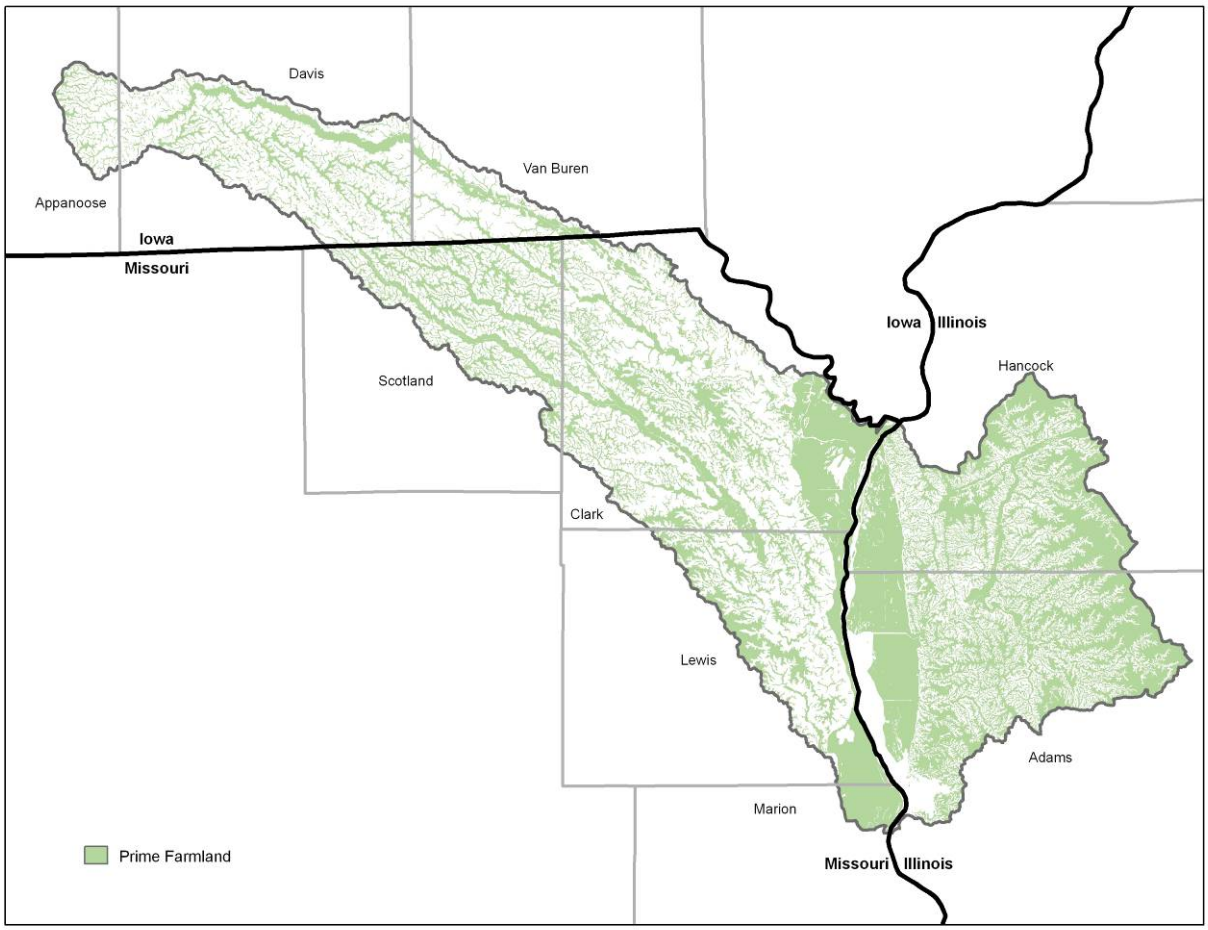
Figure 4

Land Capability Class	Cultivated cropland (acres)	Non-cultivated cropland (acres)	Pastureland (acres)
I - slight limitations	12,100	0	100
II - moderate limitations	256,300	8,300	17,500
III - severe limitations	183,000	33,300	43,500
IV - very severe limitations	55,200	5,800	37,800
V - no erosion hazard, but other limitations	-	-	-
VI - severe limitations, unsuited for cultivation, limited to pasture, range, forest	21,800	9,100	45,000
VII - very severe limitations, unsuited for cultivation, limited to grazing, forest, wildlife	-	-	13,800
VIII - misc. areas have limitations, limited to recreation, wildlife and water supply	-	-	-
Total	**528,400**	**56,500**	**157,600**

Prime Farmland[4,5]

Prime Farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses. It has the soil quality, growing season, and moisture supply needed to produce economically sustained high yields of crops when treated and managed according to acceptable farming methods, including water management. In general, prime farmlands have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding.

Figure 5-Prime Farmland in the Bear-Wyaconda Sub-basin [5]



Prime Farmland[2]**—Change from 1982 to 1997**				
State	**Illinois**	**Iowa**	**Missouri**	**Sub-basin Total**
1992	169,800	40,400	223,200	433,400
1997	166,800	39,900	222,400	429,100
Change (acres)	**Down 3,000**	**Down 500**	**Down 800**	**Down 4,300**
Change (percent)	**Down 2%**	**Down 1%**	**Down 0.003%**	**Down 1%**

F. Common Resource Areas[6]

NRCS has divided the Nation into ecological type land regions called Major Land Resource Areas (MLRA). MLRAs are defined by their agricultural potential and soils capabilities and provide a spatial framework for addressing national and regional agricultural issues. A Common Resource Area (CRA) is a geographic and ecologic subdivision of an MLRA within which there are similar resource concerns and treatment requirements.

Each Missouri CRA is a grouping of Land Type Associations (LTA) taken directly from the state's ecological classification system (ECS). Missouri's LTAs are primarily differentiated on the basis of local climate, landforms and topography, geologic parent materials, soil types and potential vegetation.

The Bear-Wyaconda Sub-basin occupies portions of MLRA 109.3, MLRA 115C.1 and MLRA 115C.3.

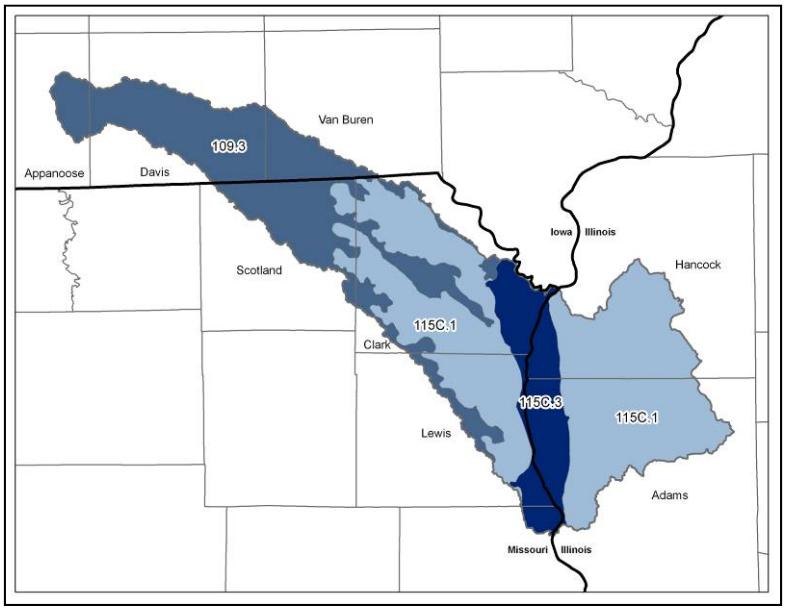
109.3 – Fox-Wyaconda River Dissected Till Plain

The Fox-Wyaconda River Dissected Till Plain CRA is gently sloping to steep area consists of a slightly dissected till plain. Although relief is usually less than 150 feet, little of the flat till plain surface remains. Native vegetation was a mix of prairie grasses and deciduous trees. Most of this area is a mix of cropland and pasture. Corn, soybeans and forage crops are the most common crops. Resource concerns are water erosion, nutrient management and pasture management.

115C.1 – Central Mississippi Valley Wooded Slopes (Western and Northwestern Illinois)

The Central Mississippi Valley Wooded Slopes CRA consists of Mississippi and lower Illinois River valleys and adjacent slopes. Low areas consist of the nearly level flood plains and terraces. The Corps of Engineers maintains a levee along the Mississippi River. Adjacent uplands consist of loess hills with moderately steep to very steep side slopes and narrow to moderately wide gently sloping to moderately sloping ridgetops. Low areas are composed of poorly drained to well drained silty, clayey and loamy alluvial and outwash deposits. Corn and soybeans are the major crops. Upland areas consist of well drained to somewhat poorly drained light colored soils. Hardwood forest dominate the upland side slopes. Livestock and grain farming are dominant in the less sloping upland areas. Urban growth is evident in the area around the Quad Cities.

Figure 6. Common Resource Areas



115C.3 – Mississippi River Alluvial Plains

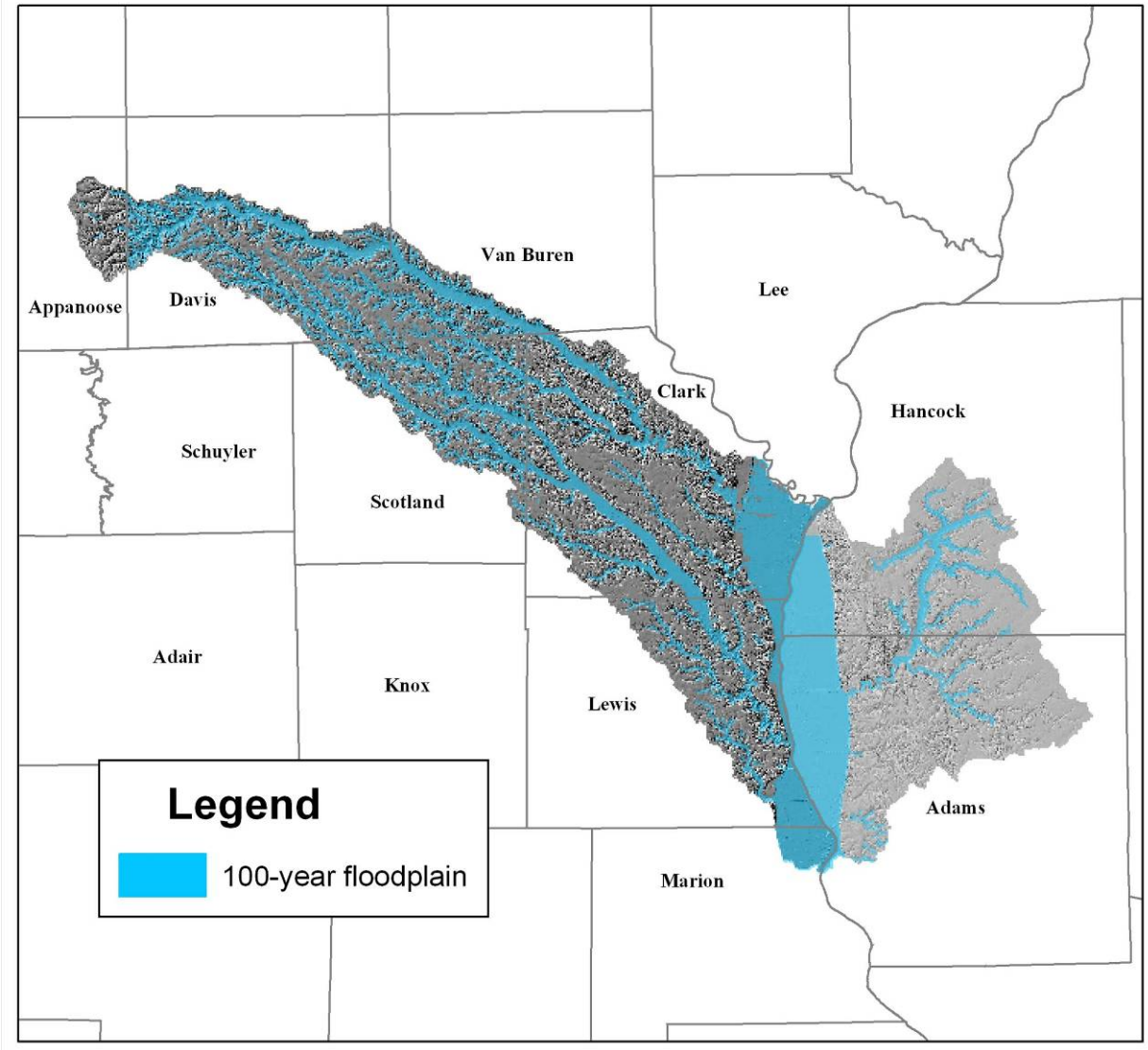
The Mississippi River Alluvial Plains CRA consists of the alluvial plain and channel of the Mississippi River. The alluvial plain has very deep loamy and clayey soils of variable drainage capacity. Many islands are timbered. The main bottoms are artificially drained and in cropland, but some oxbow wetlands remain.

G. Streams

Floodplains[5,7]

The Federal Emergency Management Agency (FEMA) maps areas of flood vulnerability. FEMA has produced maps for 5 of the 9 counties in this sub-basin. For the remaining counties, the SSURGO soil attribute 'flooding frequency' was used. Flooding frequency documented a rare, occasional, frequent and very frequent cumulatively represent the 1% annual chance of flooding, or 100-year floodplain, as shown from the FEMA data. Using these combined methods, 240,680 acres (21.8%) of the sub-basin are in the 100-year floodplain.

Figure 7

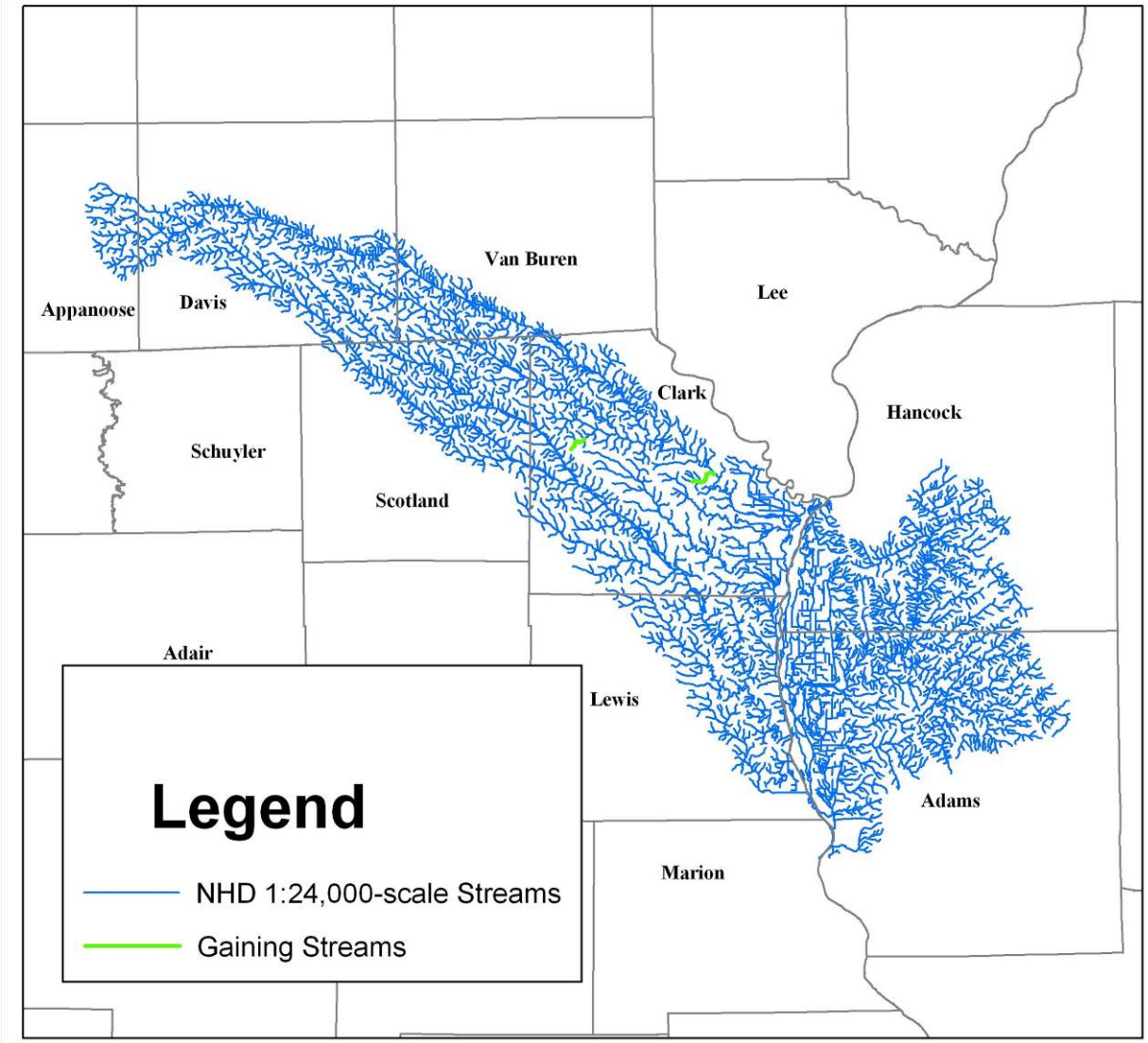


National Hydrography Dataset (NHD) with Gaining Streams and Biological Reference Streams [8 ,15,34]

High-resolution (1:24,000-scale) data from the National Hydrography Dataset show a total of 3,918 miles of intermittent and perennial streams in this sub-basin. Stream segments are classified 'gaining' or 'losing' by the Missouri Department of Natural Resources (MoDNR), Division of Geology and Land Survey (DGLS). The classification depicts sections of streams which are either losing water flow to the subsurface or gaining water flow from the subsurface, based on change in flow rate over a set distance. About 3.4 miles of Bear-Wyaconda sub-basin streams are considered gaining streams and there are no designated losing streams.

The Illinois and Iowa Departments of Natural Resources have not created data files directly analogous to the gaining/losing data available for Missouri. A file mapping streams protected from channelization by Iowa law was consulted and no streams were indicated in this sub-basin.

Figure 8



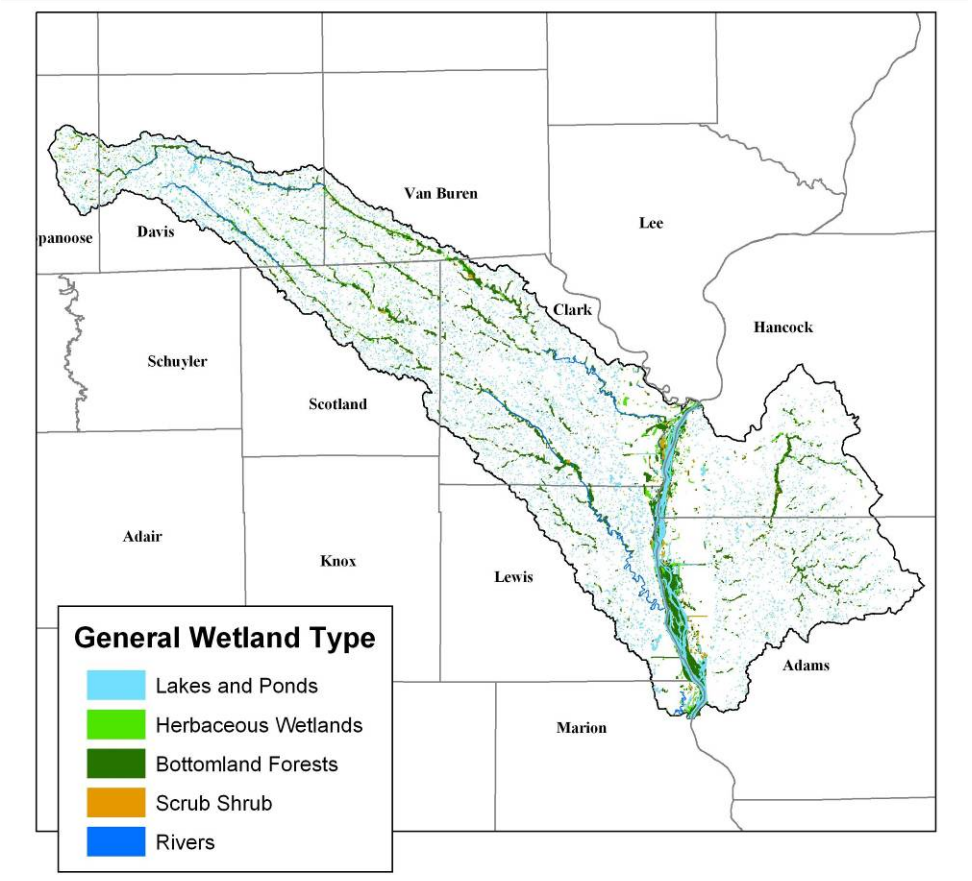
H. Wetlands[9,10]

Wetlands consist of land areas that are flooded or saturated by surface or ground water often enough to support plant and animal lifeforms that are adapted to wet environments.

The National Wetland Inventory (NWI) delineated wetlands from early 1980s aerial photography and classified wetlands using a wetland classification scheme developed by Cowardin, et al. Iowa Department of Natural Resources is in process of updating and remapping the NWI in Iowa using 2002 color infrared aerial photography. Updated NWI data were available for Appanoose and Davis counties. Using the combination of the original NWI and updated NWI where available, 59,360 acres of various wetland types were identified within the Bear-Wyaconda sub-basin.

Figure 9

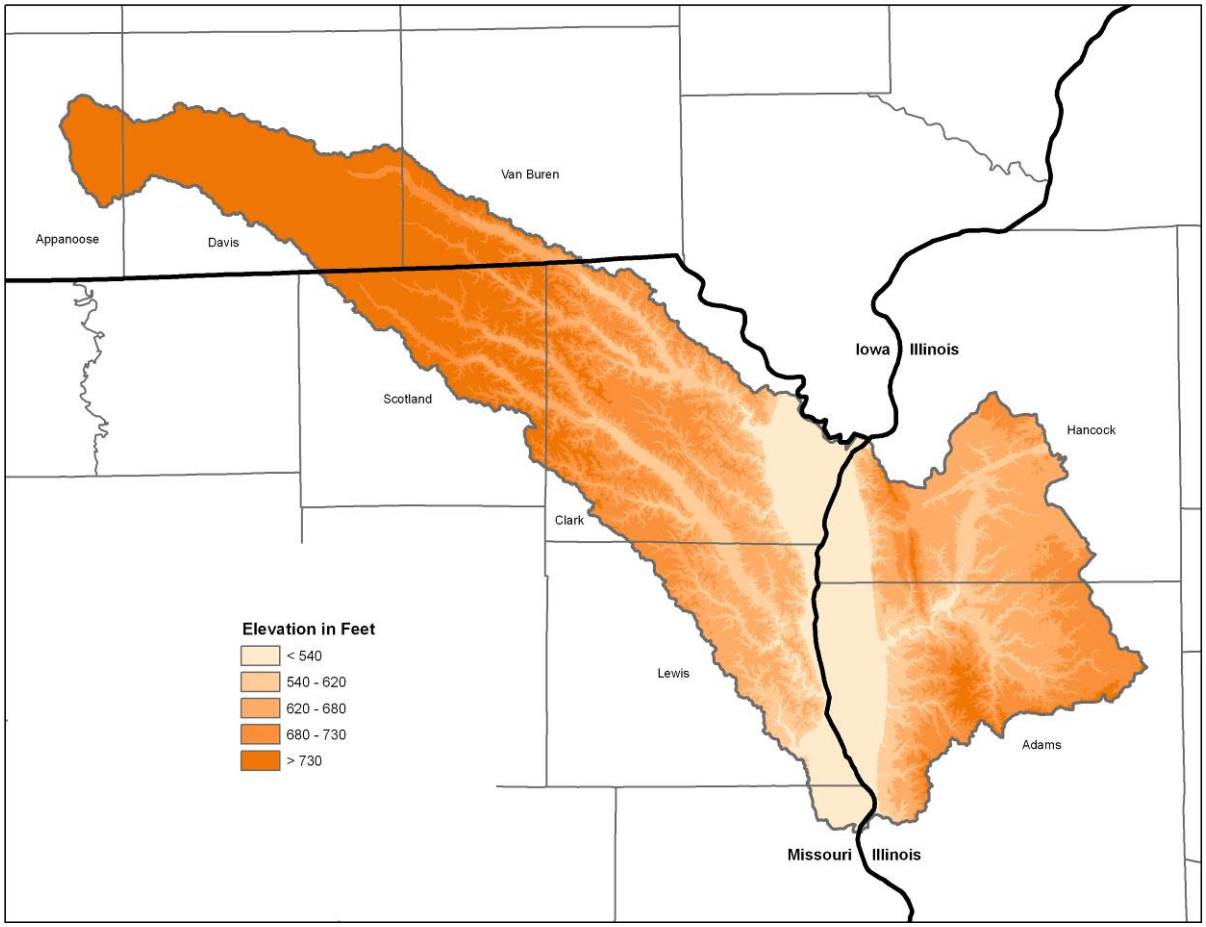
General Wetland Type	Acres	Percent of Sub-basin
Lakes and Ponds	22,303	2.02%
Herbaceous Wetlands	3,799	0.34%
Bottomland Forests	29,464	2.67%
Scrub Shrub	1,974	0.18%
Rivers	1,821	0.16%
Total	**59,360**	**5.37%**



I. Relief Map[1,11,12]

The shaded relief map of the Bear-Wyaconda Sub-basin depicts elevations above sea level. The shaded relief and elevation values were derived from digital elevation models generated from U.S. Geological Survey 7.5 minute elevation contours. The area is primarily a dissected plain formed on glacial till and can have a thin cover of loess. Concentrated water flow erosion has dissected the land surface into parallel and low relief ridges and valleys. Elevations can range from 330 feet in the lowest valleys to nearly 1,000 feet on the highest ridges. Over most of the sub-basin local relief can vary from 75 to 150 feet. Along the eastern fringe of the sub-basin lies the Mississippi River Alluvial Plains. This area is composed primarily of silty and loamy materials with a local relief of less than 10 feet.

Figure 10



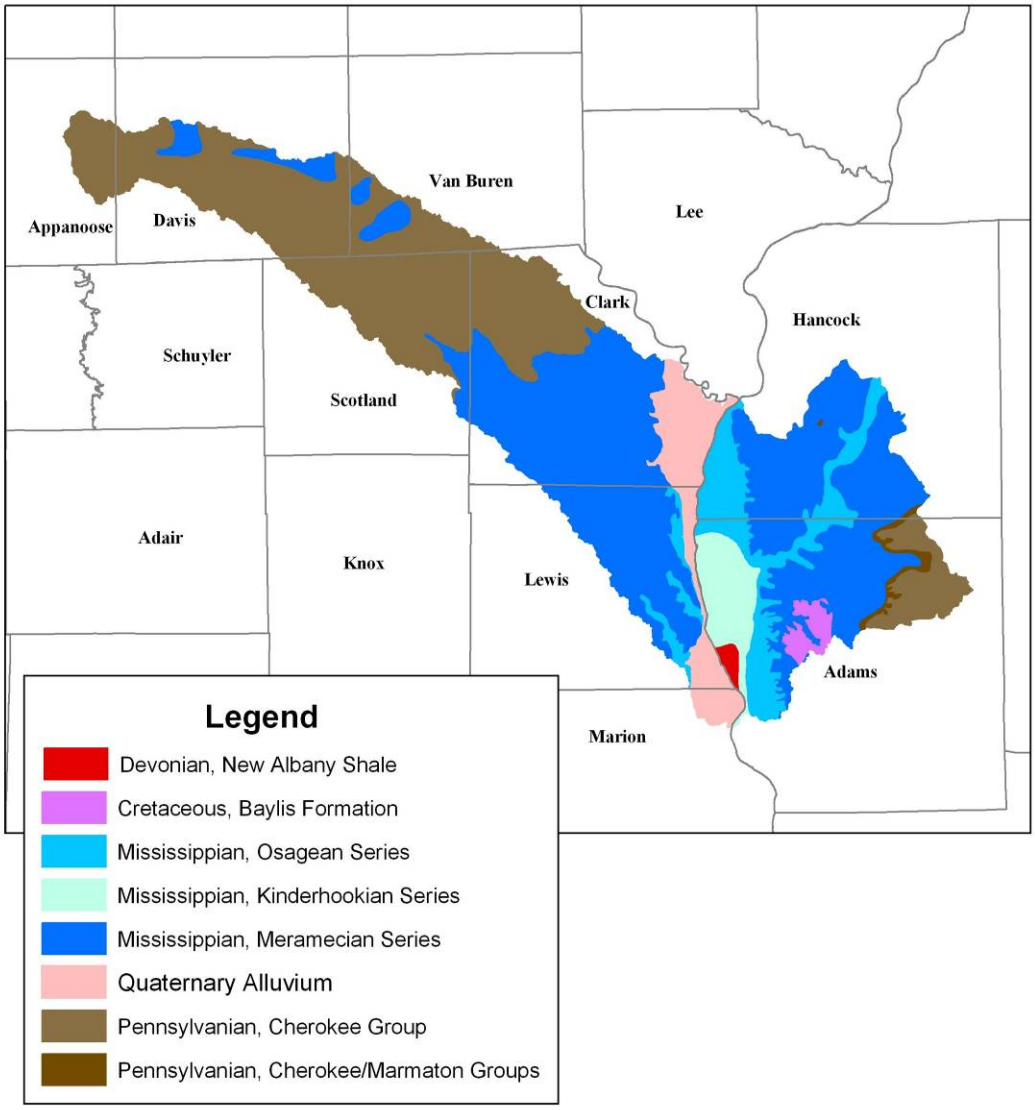
J. Geology[1,13,14,33]

Geology Map

This composite bedrock geology map is derived from the bedrock geology maps of Missouri, Iowa, and Illinois. In the Missouri and Iowa portions of the Bear/Wyaconda sub-basin Pennsylvanian-age bedrock formations are present in the northern areas while Mississippian-age units are found predominantly in the south. In most cases, the bedrock strata lie horizontally and are covered by 100 to 300 feet of glacial till and up to 8 feet of loess. Mississippian-age bedrock units of the Meramecian, Osagean, and Kinderhookian series are present in the Illinois portion of the sub-basin. Also found in Illinois are the Cretaceous-age Baylis Formation, the Pennsylvanian-age Marmaton/Cherokee groups, and the Devonian-age New Albany Shale.

Bedrock units in the Missouri and Iowa portions of the Bear/Wyaconda sub-basin can be further divided into the following systems, groups, and formations in descending order:

Figure 11



Pennsylvanian Sub-System

- Cherokee group (Cabaniss Subgroup) – Consists of cyclic deposits of sandstone, siltstone, shale, underclay, limestone and coal beds.
- Cherokee Group (Krebs Subgroup) - Consists of alternating beds of sandstone, siltstone, shale , clay, limestone, and coal beds. Sandstone can make up a greater part of the group in some areas.

Mississippian System

- Meramecian Series– Consists primarily of fine to coarse crystalline and fossiliferous limestone and often contains geodes in the lower portion.
- Osagean Series—Consists predominately of crystalline limestone and can contain sparse to abundant chert. Thin Shale beds can also be present.
- Kinderhook Series—Generally consists of the Chouteau Limestone and the overlying Hannibal Shale.

Karst features[15,35,36]

Karst topography is generally formed over carbonate bedrock such as limestone and dolomite by dis-solving or solution. It is often characterized by sinkholes, caves, underground drainage and losing streams. The Bear-Wyaconda sub-basin is not a highly-developed karst region. Karst-indicating GIS data layers were consulted for the portions of Missouri, Iowa and Illinois in the sub-basin; although of widely-varying format, none showed much evidence of karst. Three unnamed springs of unmeasured flow are mapped in Missouri while three small areas totaling 25.6 acres of sinkholes were documented in Illinois and no features were mapped in Iowa.

Resource Concerns

Resource concerns are issues related to the natural environment. Natural resources include soil, water, air, plants, animals, and humans. Field office personnel of the USDA-Natural Resources Conservation Service were asked to complete inventory sheets in order to identify the 4 primary resource concerns for 5 landuse categories within the Bear-Wyaconda Watershed (Hydrologic Unit 07110001). The identified concerns are: PASTURELAND - (1) soil erosion-classic gully; (2) plant condition-productivity, health, and vigor; (3) plant condition-forage quality and palatability; (4) water quantity-excessive runoff, flooding, or ponding. CULTIVATED CROPLAND - (1) soil erosion-sheet and rill; (2) soil erosion-ephemeral gully; (3) water quantity-excessive runoff, flooding, or ponding; (4) fish and wildlife-inadequate cover/shelter. DEVELOPED LAND - (1) soil erosion-sheet and rill; (2) soil erosion-classic gully; (3) soil erosion-streambank; (4) water quantity-excessive runoff, flooding, or ponding. FORESTLAND - (1) soil erosion-classic gully; (2) plant condition-productivity, health, and vigor; (3) plant condition-wildfire hazard; (4) water quantity-excessive runoff, flooding, or ponding. NON-CULTIVATED CROPLAND - (1) soil erosion-classic gully; (2) plant condition-productivity, health, and vigor; (3) plant condition-forage quality and palatability; (4) water quantity-excessive runoff, flooding, or ponding.

Figure 12

Resource Concerns/Issues by Land Use

Soil, Water, Air, Plant, Animal, plus Human (SWAPA+H) Concerns	Specific Resource Concern/Issue	Pasture/Grass	Cropland	Non-Cultivated Cropland	Forestland	Urban	Floodplain	Developed Land	Water
Soil Erosion	43% of all cropland eroding at levels above "T"		X						
	Erosion on streambanks and streambeds	X	X		X	X	X		
	Erosion and runoff from construction sites					X			
	Erosion from ephemeral gullies		X						
	Erosion from classical gullies	X	X		X	X			
Sedimentation	Damages to waterbodies, increased flooding						X		X
Prime Farmland	4,300 acres lost between 1982 and 1997	X	X		X		X		
Soil Quality	Degradation of soil quality		X						
Water Quality/ Quantity	Cultivated cropland primary nonpoint source of pollutants		X						X
	Excessive runoff, flooding or ponding			X					
	Fox River (Davis Co., Iowa) not meeting water quality standards								X
Floodplains	Approximately 240,000 acres fall within the 100-year flood area						X		
Riparian Corridors	27% of riparian zones unprotected or vulnerable	X	X			X	X		

Soil Erosion

- Streambank, streambed, and classical gully erosion occurs in pasture/grassland, cropland, forestland, and urban areas. However, due to a lack of reliable data at the sub-basin (8-digit hydrologic unit) level, the degree and amount of soil loss from these sources is not known.
- Ephemeral gully erosion occurs primarily on cultivated cropland eroding at levels above the tolerable limit ("T"). No sub-basin level data are available to determine the degree and extent.
- An estimated 43 percent (228,400 acres) of all cultivated cropland is eroding at levels above "T".
- The estimated USLE soil loss on highly erodible, cultivated cropland (eroding above "T") is 12.3 tons/acre/year.
- Erosion and runoff is occurring from construction sites primarily found in and near urban areas.

Sedimentation

- Excessive sedimentation can reduce the useful life of ponds, lakes, reservoirs, and wetlands and can increase the severity and frequency of flooding by reducing the water carrying capacity of streams and rivers.

Soil Quality

- Excessive soil erosion is a primary contributor to soil quality degradation. This limits the productivity and sustainability of the soil resource.

Water Quality

- Highly erodible and cultivated croplands with USLE soil losses above tolerable limits ("T") are a primary non-point source of sediment, nitrogen, and phosphorus pollutants that enter the stream system.
- One waterbody in Davis Co, Iowa appears on the 303(d) list and is not meeting water quality standards. Pollutants listed include low dissolved oxygen and organic enrichment.

Floodplains

- An estimated 240,680 acres fall within the 100-year return period flood area. This can result in damages to crops, pastures, and other resources, as well as damages to roads, bridges, and buildings.

Riparian Corridors

- The data suggest that about 27 percent of the riparian corridors, primarily in cropland, pasture/grass, and urban areas, are unprotected or vulnerable. Protected riparian corridors can act as filters to trap nutrients, sediment, and other pollutants.

A. Soils

Most of the upland soils of this sub-basin formed in glacial till covered with a mantle of loess of variable thickness. These soils are nearly all very deep and range from moderately well drained to poorly drained.

The soils on the broad upland divides formed in a thick mantle of loess overlying the glacial till. They formed under tall grass prairie vegetation and have thick, dark silt loam surface layers. They typically have clayey subsoils.

Soils on the highly dissected side slopes of the uplands formed mainly in glacial till. They developed under forested vegetation and have thin, loamy surface layers and clayey subsoils.

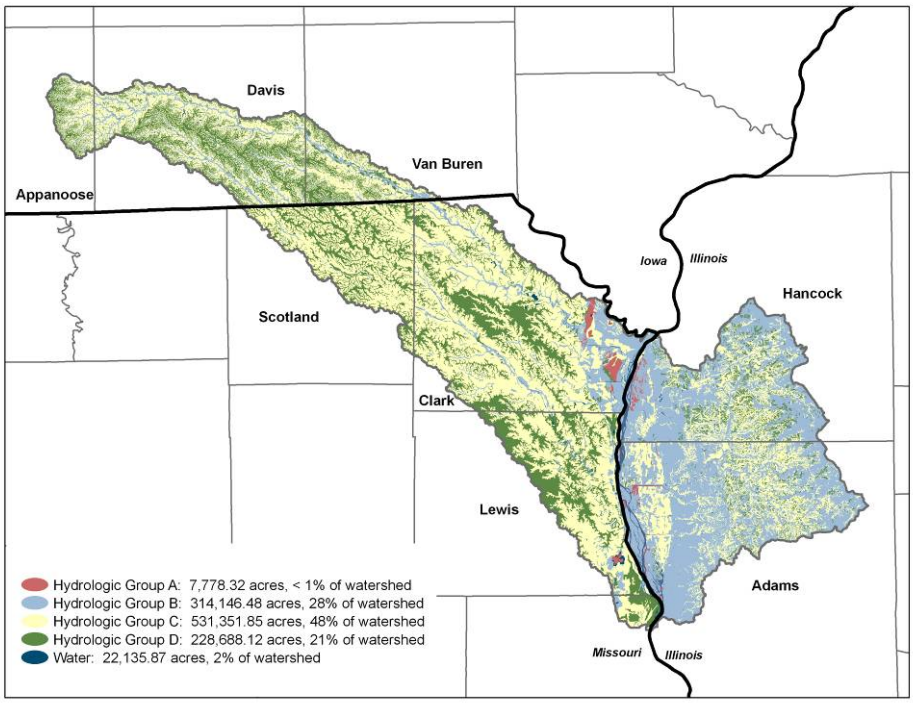
The floodplain soils formed in mixed alluvium along the Mississippi River and its tributaries. Near the main channels, the soils are typically silty or sandy, and well drained. The soils in the back swamp areas adjacent to the uplands are typically clayey and poorly drained.

Hydrologic Soil Groups[5]

In addition to the sub-basin-wide NRI erosion estimates, a spatial assessment of erosion potential was implemented using SSURGO soils data and land cover. The acres most in need of conservation practices (acres with the highest potential for sediment loss, if cropped) have been targeted based on a major finding from model simulations of soil loss outcomes reported by the NRI-Conservation Effects Assessment Project (CEAP), (NRCS, 2006): ***Hydrologic soil group and soil texture account for a large part of the variability in the loss of sediment, nitrogen and phosphorus from field to field.*** Based on average per acre sediment loss rates by hydrologic soil groups and soil texture groups reported in the CEAP study, each hydrologic soil group was divided into three classes of sediment loss potential: (1) higher average, (2) moderate average and (3) lower average.

The amount of sediment loss from sheet and rill erosion is determined by the amount of precipitation, tillage practices, soil characteristics and the presence or absence of conservation practices and can vary considerably from field to field. A significant portion of this variability can be accounted for by hydrologic soil groups (HSG) and soil texture differences within the hydrologic groups. This map shows the spatial distribution of hydrologic soil groups A,B,C and D.

Figure 13



Sediment Loss Potential on Hydrologic Soil Group A (if used for cropland)

The lowest sediment losses can be expected on these well-drained soils with high infiltration rates. They represent a very small percentage of a sub-basin and a small percentage of cropland acres. The lower average loss rate category is defined using the moderately coarse and coarse texture groups.

Sediment Loss Potential on Hydrologic Soil Group B (if used for cropland)

Acreages for this hydrologic soil group are typically high with a large number of cropland acres. Acres with the highest potential for sediment loss are defined by medium and fine soil texture groups. Soils with a medium average sediment loss potential are represented by moderately coarse and moderately fine textured soils. Coarse textured soils in hydrologic soil group B dominate the areas with the lowest average sediment loss rate potential. Average soil loss rates for all texture groups will tend to be at or below the average for the sub-basin.

Sediment Loss Potential on Hydrologic Soil Group C (if used for cropland)

This is the largest hydrologic soil group in the sub-basin with a large cropland acreage. Higher average sediment loss rates are reflected in the medium texture soil group. The moderate average sediment loss rate category is made up of the coarse and moderately coarse and fine and moderately fine soil texture groups. Average soil loss rates for all the texture groups will tend to exceed the average for the sub-basin.

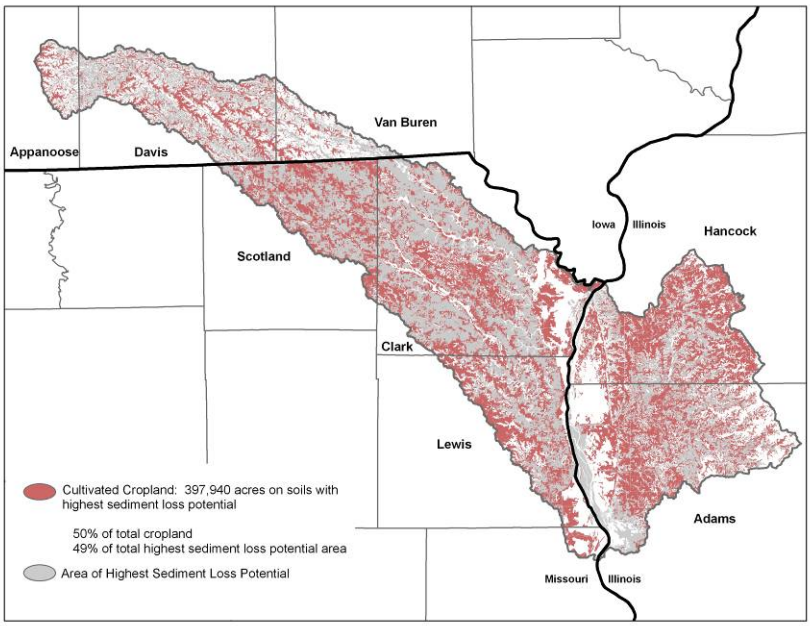
Sediment Loss Potential on Hydrologic Soil Group D (if used for cropland)

This is the second smallest hydrologic soil group in the sub-basin but it is dominated by cropland. The higher average sediment loss rates are on the medium textured soils and the moderate average sediment loss rates are produced by the fine and moderately fine soil texture groups. The coarse and moderately coarse soil texture groups generate the lower average sediment loss rates.

Acres of Cultivated Cropland on Soils with the Highest Sediment Loss Potential[5]

This map is a composite of the acres that have the highest soil loss potential in each hydrologic soil group. The qualifying soils in each hydrologic soil group are: Group A (no qualifying soils);Group B medium and fine textured soils); Group C medium textured soils); and Group D (medium textured soils). The salmon colored areas are currently under cultivation and represent the acres that could benefit the most from the application of conservation practices, if not already implemented.

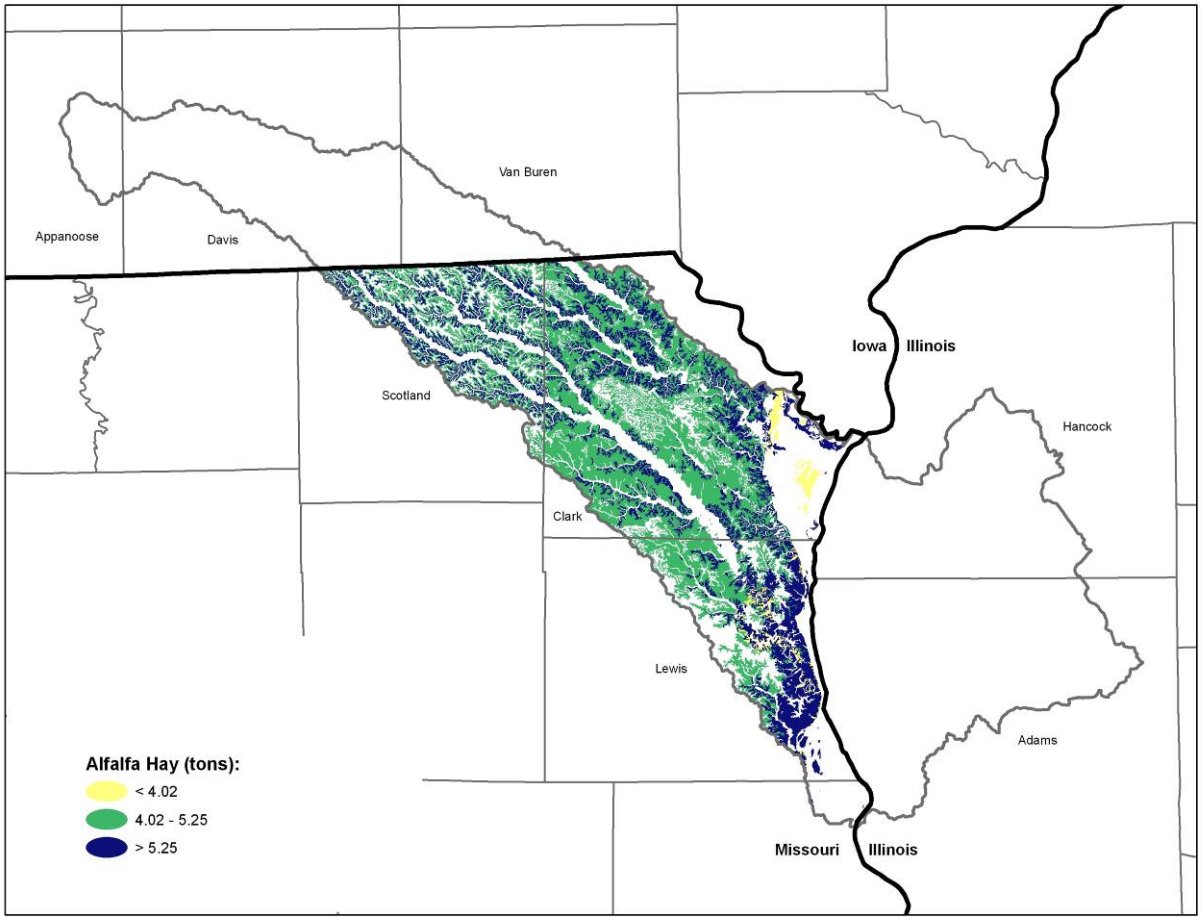
Figure 14



Pasture Productivity[5,30]

"Alfalfa is the most productive legume for Missouri, with potential yields exceeding six tons of hay per acre on good soils. Unlike red or white clover, established alfalfa is productive during midsummer except during extreme drought. Alfalfa is a tap-rooted crop and can last five years and longer under proper management. Whether grazed or fed as hay, alfalfa is an excellent forage for cattle and horses. Alfalfa is best adapted to deep, fertile, well-drained soils with a salt pH of 6.0 to 6.5, but it can be grown with conservative management on more marginal soils."

Figure 15—Alfalfa Hay Yield Estimates (tons per acre)

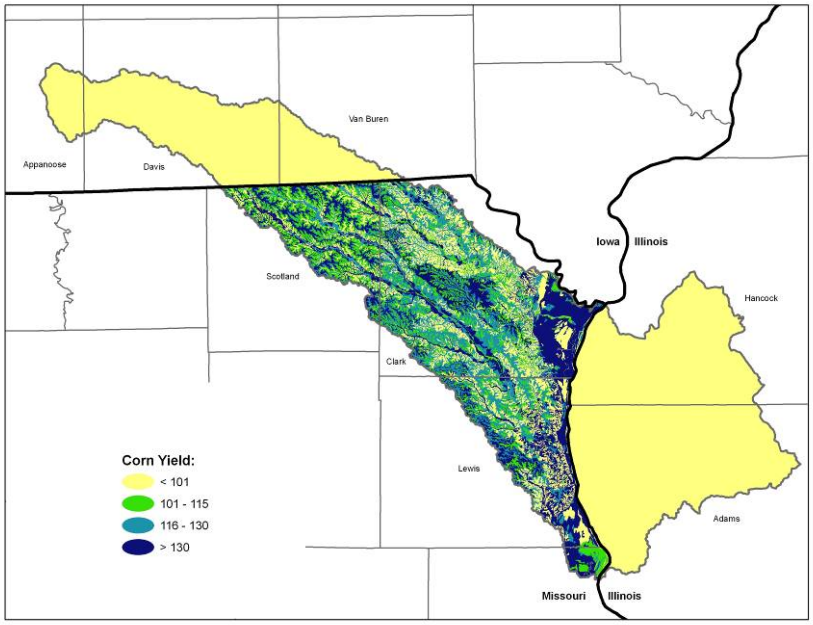


Soil Productivity[5]

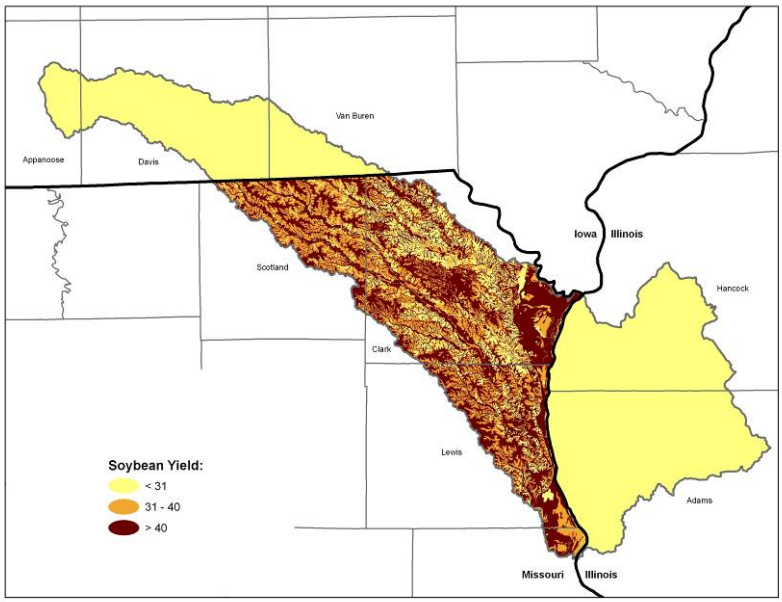
Yield estimates were developed using Missouri's Productivity Index (PI). The PI is a method developed by soil scientists that "automatically" evaluates specific soil properties directly related to plant growth. The soil properties used are a record of many years of soil survey data stored in USDA's National Soils Information System (NASIS) . The properties include: nutrient- supplying power (Organic matter, cation exchange capacity and pH), root penetration (depth to barriers, retarding layers, etc.), wetness effects (depth to seasonal high water table), available water capacity, surface restrictions (rocks, clayey, etc.), flooding restrictions (frequency), phase restrictions (gullied, channeled), slope restrictions and climate.

Figure 16

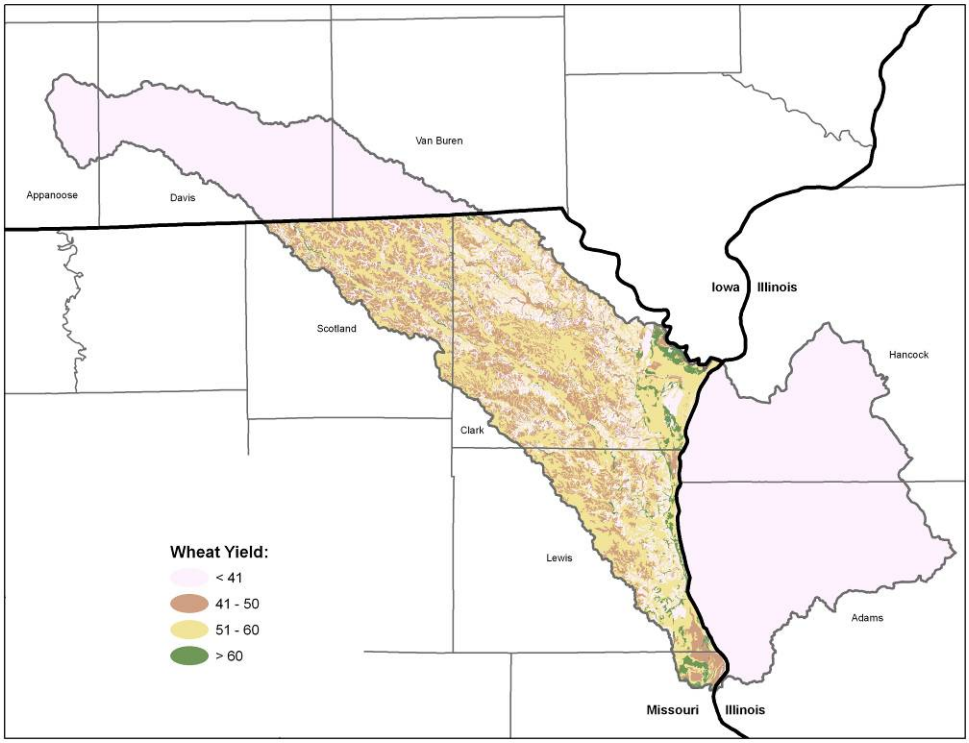
Corn Yield Estimates (bushels per acre)



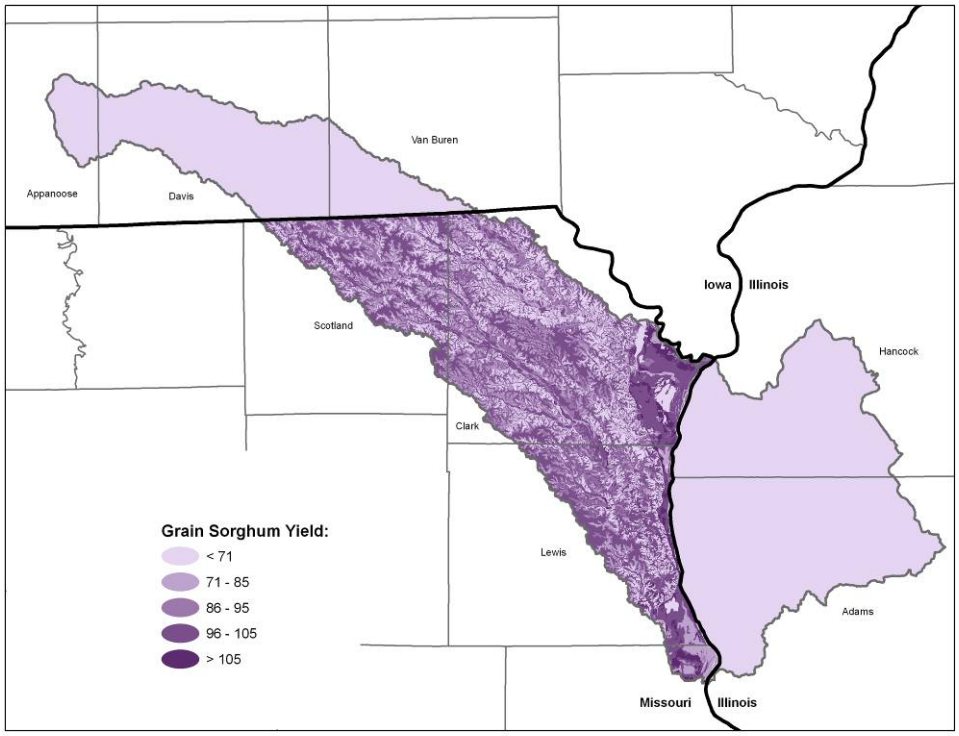
Soybean Yield Estimates (bushels per acre)



Wheat Yield Estimates (bushels per acre)



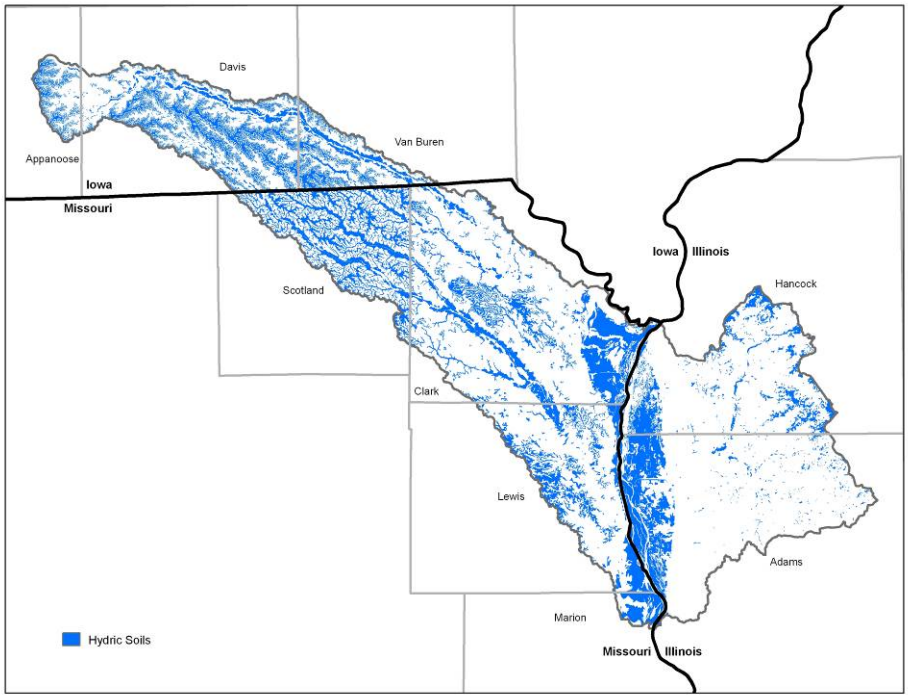
Grain SorghumYield Estimates (bushels per acre)



Hydric Soils[5]

Hydric soils are those that developed under sufficiently wet conditions (saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions) to support the growth and regeneration of hydrophytic (water-loving) vegetation. Soils that are sufficiently wet because of artificial measures are included in hydric soils.

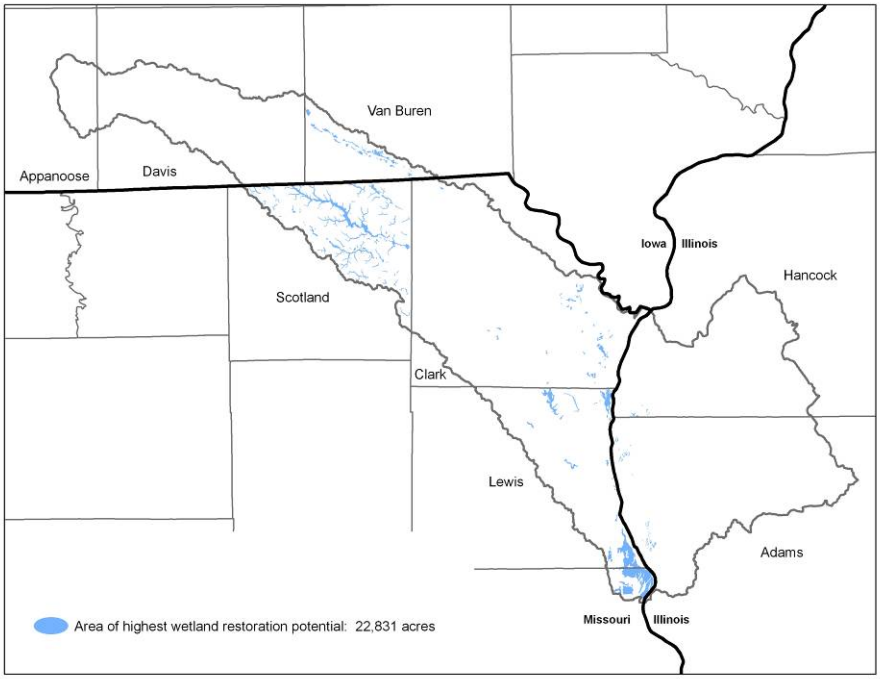
Figure 17



Wetland Restoration Potential[5]

Soils with the greatest potential for wetland restoration are located on flood plains, have a high runoff potential when thoroughly wet. Typically, they have greater than 40 percent clay, less than 50 percent sand, and have clayey textures. In some areas, they also have high shrink-swell potential.

Figure 18



B. Soil Erosion[16]

The objectives of this section are to profile cropland erosion rates and identify cropland areas within the Bear-Wyaconda sub-basin that would benefit the most from the application of conservation practices to limit sediment loss.

"**The production practices and inputs used by agriculture can result in a number of pollutants entering water resources, including sediment, nutrients, pathogens, pesticides and salts." (USDA-Economic Research Service).**

"Sediment is the largest contaminant of surface water in the United States by weight and volume (Koltun et al., 1997) and the second leading pollution problem in rivers and streams and third leading problem in lakes" (USEPA, 2002).

Sediment losses from soil erosion on cropland, streambanks and streambeds and runoff from construction sites and developed land are an ongoing resource concern throughout the Bear-Wyaconda sub-basin. Cultivated cropland is the primary nonpoint source of sediment loss in this heavily cropped sub-basin and accounts for 48 percent of the sub-basin's total surface area. In sub-basins like the Bear-Wyaconda throughout the Upper Midwest Region, the acres most in need of conservation treatment are those with waterborne sediment, nitrogen and phosphorus losses.

The consequences of excessive soil erosion are well known. Waterborne sediments are inextricably linked to degraded water quality through turbidity and loss of fertilizers and pesticides attached to soil particles. Suspended sediments degrade aquatic habitats, increase water treatment costs and marginalize water recreation. Sedimentation reduces the useful life of ponds, lakes and reservoirs; increases the probability and severity of flooding; and clogs drainage networks. Excessive soil erosion is a primary contributor to soil quality degradation, limiting the productivity and sustainability of the soil.

This assessment concentrates on sheet and rill erosion on cropland for which there are scientifically based soil erosion estimates for the entire sub-basin. This focus does not suggest that sedimentation related to urban stormwater runoff, stream bank erosion, classical gully erosion and ephemeral gully erosion on cropland is not significant in volume or impact. However, there is a lack of reliable data at the sub-basin level for these other sources of sediment. The erosion rate data have been extracted from the 1997 National Resources Inventory (NRI). Erosion rates and their relationship to "T" values are reported in tons/acre/year for cultivated cropland, and non-cultivated cropland on highly erodible and non-highly erodible land. Also included are erosion rates and their relationship to "T" values for pastureland.

Universal Soil Loss Equation (USLE) Cropland Erosion Rates in Tons/Acre/Year[2]

USLE - This table reports estimated soil loss rates from the 1997 NRI based on the Universal Soil Loss Equation (USLE). USLE estimates average annual sheet and rill soil movement down a uniform slope using rainfall energy as the erosive force acting on the soil. Soil characteristics and slope for the fields in which the NRI sample points fall or those portions of the fields surrounding the points that would be considered in conservation planning are used in the NRI USLE calculations.

"T" FACTOR – This is the maximum rate of annual soil erosion that will still permit crop productivity to be sustained economically and indefinitely.

HEL – Highly erodible land (HEL) is land that has an erodiblity index (EI) value of 8 or more. The EI in-

dex provides a numerical expression of the potential for a soil to erode, considering the physical and chemical properties of the soil and climatic conditions where it occurs. The higher the index value, the greater the investment needed to maintain the sustainability of the soil if intensively cropped.

Figure 19—USLE Cropland Erosion Rates (Tons/Acres/Year)[2]

Missouri

	Highly Erodible Land (HEL)			Non-Highly Erodible Land (non-HEL)			All Cropland		
	HEL Eroding at or below "T"	HEL Eroding above "T"	All HEL	Non-HEL Eroding at or below "T"	Non-HEL Eroding above "T"	All Non-HEL	All Land Eroding at or below "T"	All Land Eroding above "T"	All Land
Cultivated Cropland	3.14	9.53	8.95	2.57	6.16	2.97	2.61	9.1	5.7
Non-Cultivated Cropland	0.88	2.39	0.9	0.3	0	0.3	0.8	2.39	0.82

Illinois

	Highly Erodible Land (HEL)			Non-Highly Erodible Land (non-HEL)			All Cropland		
	HEL Eroding at or below "T"	HEL Eroding above "T"	All HEL	Non-HEL Eroding at or below "T"	Non-HEL Eroding above "T"	All Non-HEL	All Land Eroding at or below "T"	All Land Eroding above "T"	All Land
Cultivated Cropland	2.05	10.59	9.93	2.30	5.67	2.65	2.30	9.65	4.87
Non-Cultivated Cropland	0.85	0	0.85	0.65	0	0.65	0.85	0	0.85

Iowa

	Highly Erodible Land (HEL)			Non-Highly Erodible Land (non-HEL)			All Cropland		
	HEL Eroding at or below "T"	HEL Eroding above "T"	All HEL	Non-HEL Eroding at or below "T"	Non-HEL Eroding above "T"	All Non-HEL	All Land Eroding at or below "T"	All Land Eroding above "T"	All Land
Cultivated Cropland	1.26	13.02	11.84	1.82	11.45	2.3	1.74	11.45	7.61
Non-Cultivated Cropland	0.31	0	0.31	0.31	0	0.31	0.31	0	0.31

Cropland Erosion in Relationship to "T"[2]

This table reports acres and percentages of cultivated cropland, non-cultivated cropland and all cropland by HEL and "T" categories for the sub-basin.

Cultivated Cropland

CROPLAND CATEGORY	Total Acres	% of Cropland Category	% of all Cropland	% of Sub-basin
HEL				
Highly Erodible Cropland at or below "T"	18,400	10%	100%	2%
Highly Erodible Cropland above "T"	173,800	90%	100%	16%
TOTALS FOR HIGHLY ERODIBLE CROPLAND	**192,200**	**100%**	**100%**	**18%**
NON-HEL				
Non-Highly Erodible Cropland at or below "T"	281,600	84%	100%	26%
Non-Highly Erodible Cropland above "T"	54,600	16%	100%	5%
TOTALS FOR NON-HIGHLY ERODIBLE CROPLAND	**336,200**	**100%**	**100%**	**31%**
GRAND TOTALS	**528,400**	**100%**	**100%**	**49%**

Non-Cultivated Cropland

CROPLAND CATEGORY	Total Acres	% of Cropland Category	% of all Cropland	% of Sub-basin
HEL				
Highly Erodible Cropland at or below "T"	40,800	100%	100%	4%
Highly Erodible Cropland above "T"	0	0%	0%	0%
TOTALS FOR HIGHLY ERODIBLE CROPLAND	**40,800**	**100%**	**100%**	**4%**
NON-HEL				
Non-Highly Erodible Cropland at or below "T"	15,700	100%	100%	1%
Non-Highly Erodible Cropland above "T"	0	0%	0%	0%
TOTALS FOR NON-HIGHLY ERODIBLE CROPLAND	**15,700**	**100%**	**100%**	**1%**
GRAND TOTALS	**56,500**	**100%**	**100%**	**1%**

All Cropland

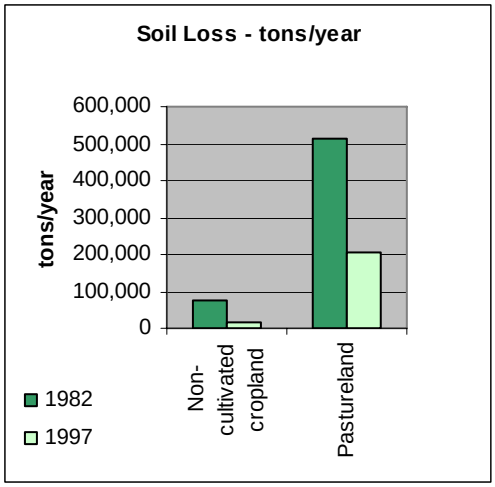
CROPLAND CATEGORY	Total Acres	% of Cropland Category	% of all Cropland	% of Sub-basin
HEL				
Highly Erodible Cropland at or below "T"	59,200	25%	100%	5%
Highly Erodible Cropland above "T"	173,800	75%	100%	16%
TOTALS FOR HIGHLY ERODIBLE CROPLAND	**233,000**	**100%**	**100%**	**21%**
NON-HEL				
Non-Highly Erodible Cropland at or below "T"	297,300	84%	100%	27%
Non-Highly Erodible Cropland above "T"	54,600	16%	100%	5%
TOTALS FOR NON-HIGHLY ERODIBLE CROPLAND	**351,900**	**100%**	**100%**	**32%**
GRAND TOTALS	**584,900**	**100%**	**-**	**53%**

Pastureland Erosion[2]

This table reports USLE rates and acres in relationship to “T” for pastureland (tons/acre/year).

PASTURELAND CATEGORY	Total Acres	% of Category	USLE tons/acre/year	% of Sub-basin
HEL				
Highly Erodible Cropland at or below "T"	0	0%	0	0%
Highly Erodible Cropland above "T"	0	0%	0	0%
TOTALS FOR HIGHLY ERODIBLE CROPLAND	**0**	**00%**	**0**	**0%**
NON-HEL				
Non-Highly Erodible Cropland at or below "T"	145,400	92%	0.77	13%
Non-Highly Erodible Cropland above "T"	12,300	8%	7.35	1%
TOTALS FOR NON-HIGHLY ERODIBLE CROPLAND	**157,700**	**100%**	**1.29**	**14%**
GRAND TOTALS	**157,700**	**100%**	**1.29**	**14%**

USLE Soil Loss Rates (tons/year)[2]



Non-cultivated Cropland

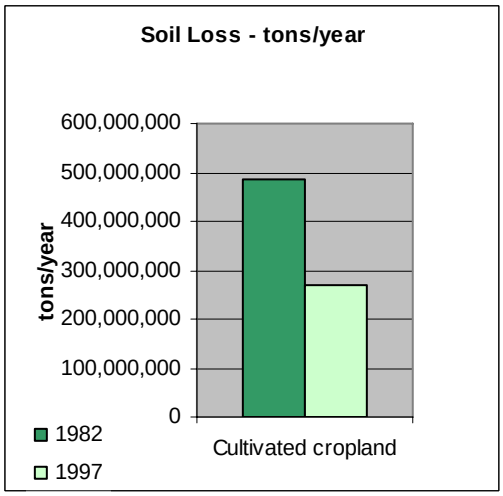
1982 76,500 tons per acre

1997 17,500 tons per acre

Pastureland

1982 513,600 tons per acre

1997 203,200 tons per acre



Cultivated Cropland

1982 486,659,500 tons per acre

1997 269,568,000 tons per acre

C. Water Quality

303d Listed Waters[17]

Section 303(d) of the federal Clean Water Act requires that each state identify waters that are not meeting water quality standards and for which adequate water pollution controls have not been required. Water quality standards protect such beneficial uses of water as whole body contact and secondary contact recreation, maintaining fish and other aquatic life, and providing drinking and processing water for people, wildlife, livestock and industry. The 303(d) list helps state and federal agencies keep track of waters that are impaired but not addressed by normal water pollution control programs.

Figure 20

Water Body	County	Pollutant	Impaired Use(s)*	Other Designated Uses*
Fox River	Davis, IA	Organic Enrichment, Low Dissolved Oxygen	AQL	**

*** Impaired and Other Designated Uses:**

AQL Protection of Aquatic Life (Warm, Cool or Cold Water)
FC Fish Consumption
WBC Whole Body Contact
SCR Secondary Contact Reaction
DWS Drinking Water Supply
IRR Irrigation
LWW Livestock and Wildlife Watering
IND Industrial

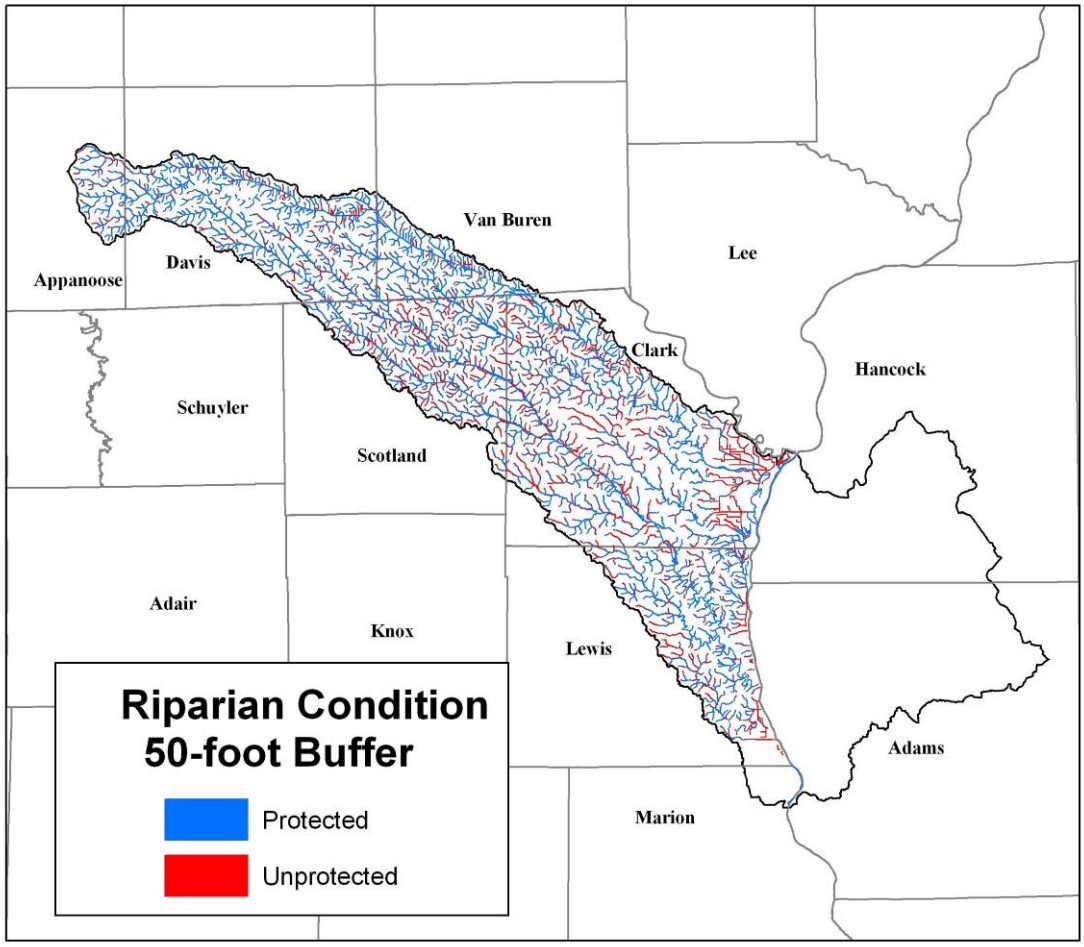
**** Data not available**

Riparian Corridor Condition[8,18]

The condition of the riparian zone adjacent to streams has a critical impact on water quality. Permanent and deeply-rooted streambank vegetation slows run-off of nutrients and pollutants, and reduces sedimentation and solar heating. NRCS riparian practice standards specify 50-feet vegetated buffers along first and second order streams and 100-feet for third order and higher streams.

The 1:24,000 National Hydrologic Dataset (NHD) stream network is the highest resolution stream representation available consistently for the sub-basin states. Stream order is not an attribute of these data; therefore, the streams were all buffered by 50-feet to give the most conservative representation of riparian condition. Buffered streams were used to subset the common land unit (CLU) data, land parcel data developed and maintained by the USDA-Farm Service Agency. The land cover attribute in the CLU was used to characterize the vegetative condition of the buffers. Cropland (which includes pasture and hayland), urban, mined and barren cover types were considered “unprotected” or vulnerable riparian conditions, while forestland, rangeland and water were considered “protected”. Results are presented by county and sub-basin in the table and map below.

Figure 21



County, State	Stream Miles (in sub-basin)	50-ft. Stream Buffer (in acres)	Percent Protected
Adams, Illinois	190	NA*	NA
Appanoose, Iowa	1,352	883	86%
Clark, Missouri	12	10,909	65%
Davis, Iowa	15	5,532	85%
Hancock, Illinois	7	NA	NA
Lewis, Missouri	173	4,138	71%
Marion, Missouri	1,291	42	100%
Scotland, Missouri	1,157	4,867	70%
Van Buren, Iowa	-	2,218	88%
Total in Sub-basin	**4,197**	**28,589**	**73%**

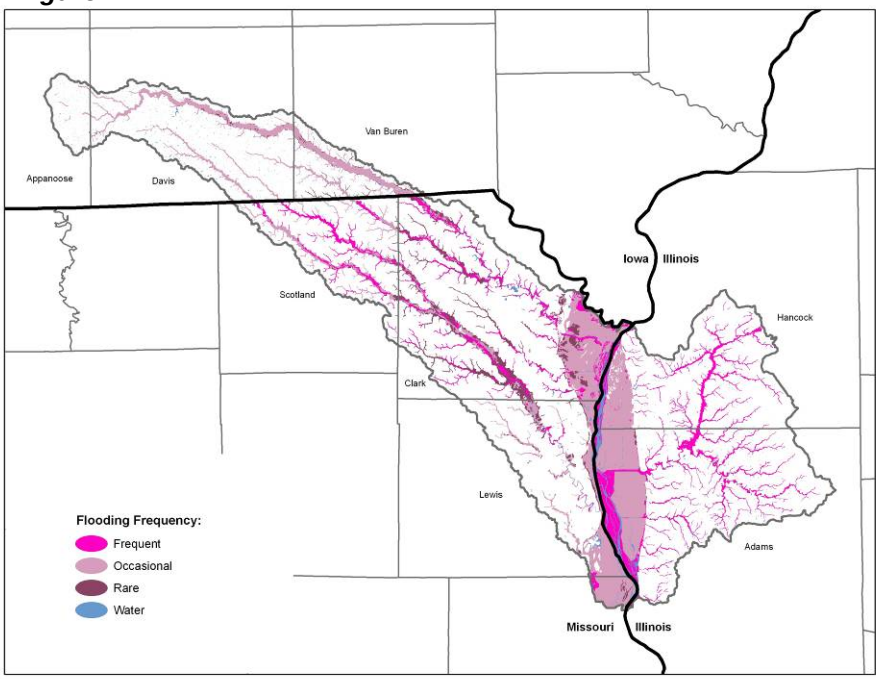
*Note: Common land unit land cover attributes were not available in Illinois.

Flooding Frequency[5]

Flooding frequencies are defined by the number of times flooding occurs over a period of time and expressed as a class. The classes of flooding are defined as follows:

- Rare—Flooding unlikely but possible under unusual weather conditions; 1 to 5 percent chance of flooding in any year or nearly 1 to 5 times in 100 years
- Occasional—Flooding is expected infrequently under usual weather conditions; 5 to 50 percent chance of flooding in any year or 5 to 50 times in 100 years.
- Frequent—Flooding is likely to occur often under usual weather conditions; more than a 50 percent chance of flooding in any year or more than 50 times in 100 years, but less than a 50 percent chance of flooding in all months in any year.

Figure 22



D. Water Quantity

Public Water Supply[20,21,22,23]

Missouri's 5.8 million residents draw their water supplies from ground and surface sources that vary tremendously in both quality and quantity. These variations are, to a large extent, controlled by geology and land use. North of the Missouri River, herbicides, sediments, and nutrients are the primary concerns in surface water sources while well sources contend with heavy mineralization, nitrates, and pesticides. In the Ozark Highlands, ground water, the primary water supply source, is vulnerable to aquifer degradation from contaminated surface runoff and leachates through highly permeable soils and bedrock. Missouri's alluvial aquifers supply large quantities of high quality water, primarily to population centers located near the larger rivers and the Mississippi embayment covering most of the southeastern corner of the state. Shallow wells are vulnerable to nitrate and pesticide contamination and the deeper wills in highly urbanized areas are at risk from a wide variety of chemical pollutants.

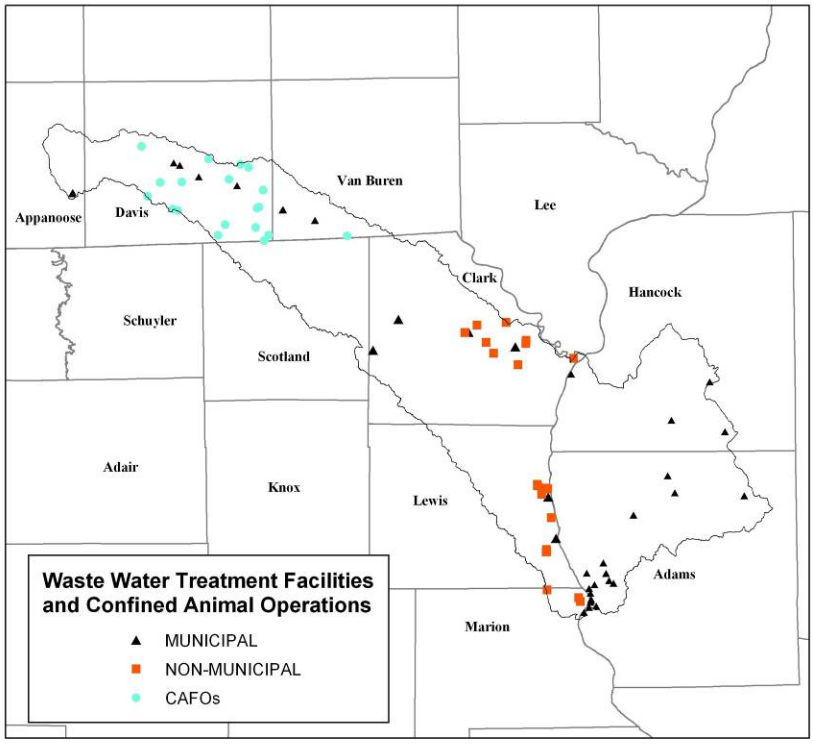
Detailed information is available for individual public drinking supply systems and the spatial distribution of other drinking water supply features (wells, intakes, tanks, treatment plants, pumping stations, springs, and lakes) from MDNR. The 2006 Missouri Water Quality Report provides current water quality assessments and summarizes water quality issues around the state. The 2007 Census of Missouri Public Water Systems is a comprehensive description of city, water district, subdivision, and non-community water systems including type of treatment processes and chemical analyses of community water systems. The 2005 Missouri Water Supply Study provides detailed technical hydrologic and water resource engineering data for drought planning for 34 community water systems in north and west central Missouri.

Waste Water Treatment Facilities and Concentrated Animal Feeding Operations[19]

The National Pollutant Discharge Eliminations System (NPDES) facilities database is a point data set depicting outfall locations of waste water facilities requiring and holding NPDES operating permits. One type of NDPES facility is a concentrated animal feeding operation, or CAFO. A CAFO is defined as having more than 7000 animal units confined in an area with less than 50% vegetation ground cover. Smaller animal unit operations may be designated a CAFO if they discharge directly into waters of the State or have a post history of discharge violations. The animal unit is a unit of measurement to compare waste produced by various animal types, using one beef feeder as a reference.

The data sets covering this sub-basin differed among Iowa, Illinois and Missouri. The Iowa concentrated animal operations layer included all confined animal operations required to be registered with Iowa Department of Natural Resources, regardless of animal unit size. In the Missouri layer, smaller animal operations (not meeting the CAFO definition) are lumped together with other non-municipal facilities such as sand and gravel operations. Additionally, the Missouri non-municipal facilities are more comprehensive than in Iowa. The Illinois data were the least robust, lacking any CAFO data or other non-municipal site information altogether. Without in-depth discussions with officials of each state in charge of the NPDES dataset, it is difficult to understand why they differ to this extent.

Figure 23



With the limitations of the data as outlined, the Bear-Wyaconda sub-basin is documented to have 19 confined hog and 1 confined cattle operations in Iowa. No CAFOs are in Missouri. Missouri has documented 6 municipal and 24 non-municipal wastewater facilities; Iowa data show 22 municipal sites and Illinois documents 34.

D. Forestry

Forests cover about a third of Missouri - forests containing some of the finest oak, walnut, and red cedar found anywhere. Forests are Missouri's greatest renewable resource, providing many economic, environmental and social benefits. They protect hillsides from erosion, keeping streams and rivers clean. They filter the air, soften the extremes of the weather, and add beauty to cities and towns. Much of Missouri's recreation and tourism industry is centered in the forested regions of the state. And forests are a diverse resource of plants, animals, birds, and other life forms. Annual growth of forests in Missouri far exceeds the amount harvested, ensuring ample forests for future generations. The majority of tree species are hardwoods with softwoods locally important in certain regions of the state. Forest products are also important to Missouri. Harvesting and processing trees into wood products gives thousands of people jobs and contributes about $3 billion each year to Missouri's economy. Private landowners control 85 percent of the forest land in Missouri. Most of these private forested acres in Missouri are not following a management plan.

The following tables for this sub-basin are based on data compiled from The Forest Inventory and Analysis (FIA) Program of the U.S. Department of Agriculture (USDA) Forest Service. Information from USDA-Forest Service, National Forest Inventory and Analysis Database, 2005 is available at www.fia.fs.fed.us/tools-data/default.asp.

Area of Forestland by Ownership in Sub-Basin

Private	537,755 acres
Federal	14,097 acres
State	198,312 acres
County and municipal	0 acres
Other	0 acres
Total	571,684 acres

Area of Forestland by Stocking Class in Sub-Basin

Overstocked	5,641 acres
Fully stocked	150,567 acres
Medium stocked	238,703 acres
Poorly stocked	141,066 acres
Non-stocked	35,707 acres
Total Growing Stock	571,684 acres

Area of Forestland by Productivity Site Class in Sub-Basin

165-224	0 acres
120-164	15,488 acres
85-119	125,396 acres
50-84	314,073 acres
0-49	116,727 acres
Total	571,684 acres

Net Volume of Growing Stock on Forestland by Species Type in Sub-Basin

Softwoods	9,375,351 cubic feet
Hardwoods	626,342,354 cubic feet
Other	0 cubic feet
Total	635,717,705 cubic feet

E. Threatened and Endangered Species[20,34]

The Missouri and Iowa Natural Heritage databases store locations, population status and habitat information about species and communities of conservation concern. Similar data were unavailable for the Illinois portion of the Upper Grand sub-basin. The table below is a subset of the Heritage records that occur in the Missouri and Iowa portions of the sub-basin, restricted to federally threatened, endangered or candidate and state threatened or endangered species. While Heritage data can not prove the absence of a species in an area, it is the best collection available of known locations of sensitive species and is used to assess potential impacts of various land management activities in the region.

Figure 24

Species Type	Species Common Name	Scientific Name	Threatened, Endangered, or Candidate	Federal or State Listing
Amphibians/ Reptiles	Blanding's Turtle	Emydoidea blandingii	Endangered	State-MO
	Copperhead	Agkistrodon contortrix	Endangered	State-IA
	Crawfish Frog	Rana areolata	Endangered	State–IA
	Diamondback Water Snake	Nerodia rhombifer	Threatened	State-IA
	Illinois Mud Turtle	Kinosternon flavescens spooneri	Endangered	State-MO
	Slender Glass Lizard	Ophisaurus attenuatus	Threatened	State-IA
	Speckled Kingsnake	Lampropeltis getulus	Threatened	State-IA
	Western Fox Snake	Elaphe vulpina vulpina	Endangered	State-MO
Birds	Bald Eagle	Haliaeetus leucocephalus	Endangered/ Endangered	State-IA,MO
	Henslow's Sparrow	Ammodramus henslowii	Endangered	State-IA
	Northern Harrier	Circus cyaneus	Endangered	State-IA
	Short-eared Owl	Asio flammeus	Endangered	State-IA
Crustaceans/ Fish/Mollusks	Central Mudminnow	Umbra limi	Endangered	State-MO
	Fat Pocketbook	Potamilus capax	Endangered/ Endangered	Federal/ State-MO
	Lake Sturgeon	Acipenser fulvescens	Endangered	State-MO
	Topeka Shiner	Notropis topeka	Threatened	State-IA
Mammals	Indiana Bat	Myotis sodalis	Endangered/ Endangered	Federal/ State-IA,MO
	Southern Bog Lemming	Synaptomys cooperi	Threatened	State-IA
Plants	Downy Woodmint	Blephilia ciliata	Threatened	State-IA
	False Hellebore	Veratrum woodii	Threatened	State-IA
	Golden Corydalis	Corydalis aurea	Threatened	State-IA
	Slender Ladies'-tressess	Spiranthes lacera	Threatened	State-IA
	Slim-leaved Panic Grass	Dichanthelium linearfolium	Threatened	State-IA
	Tubercled Orchid	Platanthera flava	Endangered	State-IA
	Winged Monkey Flower	Mimulus alatus	Threatened	State-IA

Census and Social Data

A. Census Bureau[21]

Block group-level GIS data files from the 1990 and 2000 Census were used to illustrate population, population change, income and the agricultural cohort for the sub-basin. Spatial files were clipped by the sub-basin boundary. The percent of the block group falling in the watershed was calculated, and population figures were prorated by this value. Although this technique erroneously assumes even spatial distribution of population, it is a more accurate population count for the sub-basin than including the entire block group population.

Figure 25a. 1990 Population-The 1990 estimated population of the sub-basin was 74,806.

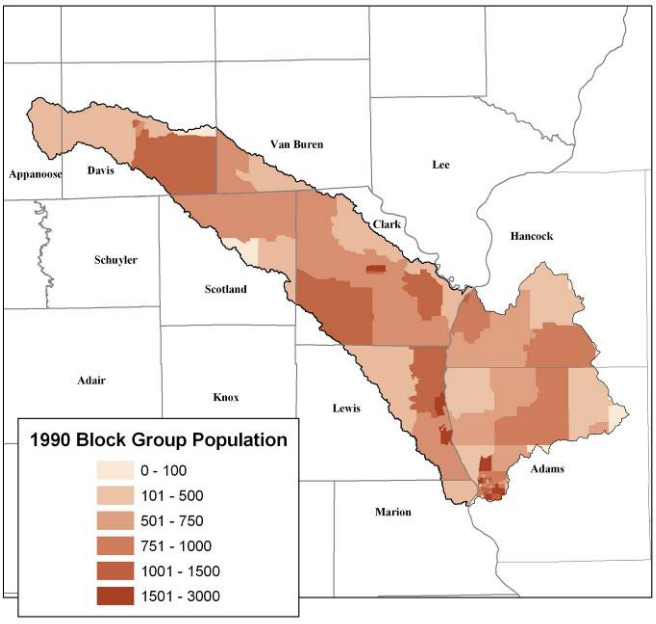
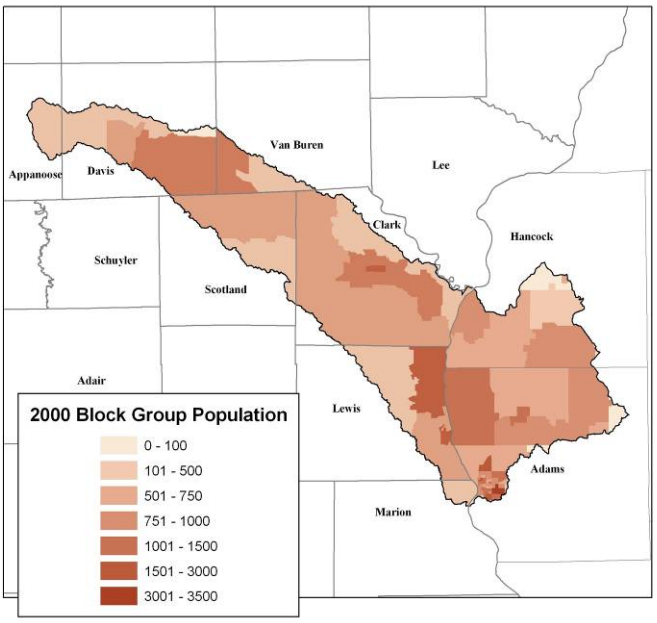


Figure 25b. 2000 Population—The 2000 estimated population of the sub-basin was 74,220.



Change in Population

The 1990 estimated population of the sub-basin was 74,806 and was down to 74,220 by 2000, representing a 586 person or about 1 per cent decrease overall. A modest population gain was documented in Missouri and Illinois which was offset by population decline in the Iowa portion of the sub-basin.

Figure 25c. Income—Per capita income (data unavailable for Iowa).

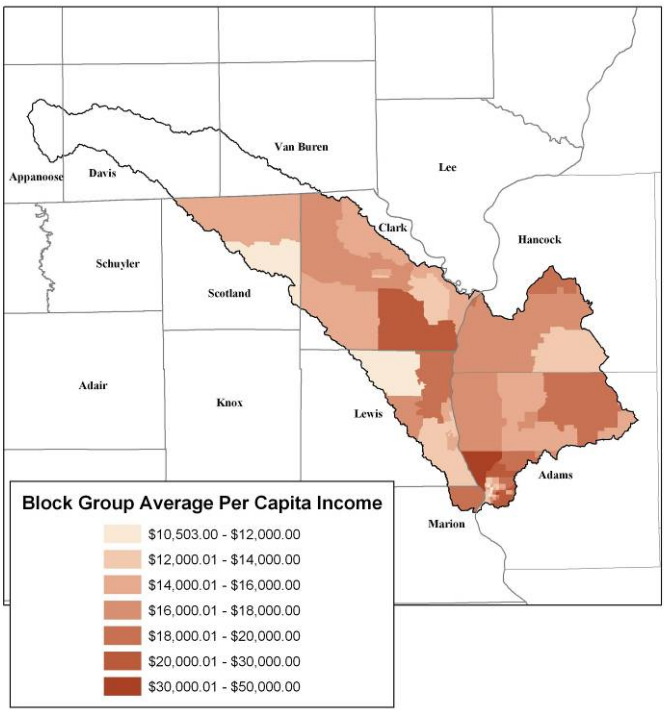
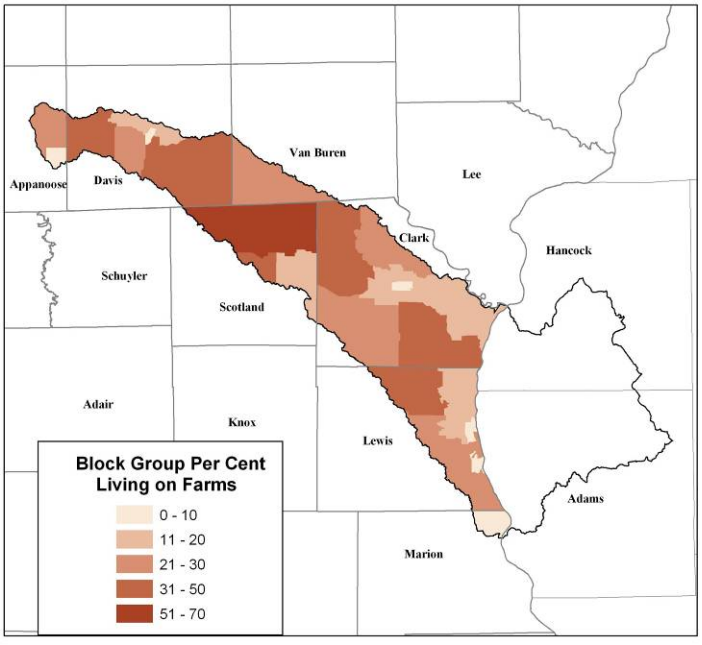


Figure 25d. Percent living on farms (data unavailable for Illinois).



B. Agricultural Census[23]

The data shown in the table are totals for complete counties. County land area acreages and percentages are supplied to assist the user in calculating sub-county estimates. Grazing livestock includes cattle, sheep, horses and ponies and goats.

Figure 26

COUNTY SUMMARY HIGHLIGHTS, 2002			
	Iowa	**Illinois**	**Missouri**
Farms	2,693	2,442	2,921
Land in Farms	779,780	875,910	1,002,581
Hogs & Pigs	113,493	195,735	63,166
Poultry	4,756	2,055	5,061
Cattle	116,249	460,187	103,051
Sheep	10,195	3,068	2,535
Horses & Ponies	4,435	1,539	3,002
Goats	unavailable	154	240
Cropland Used only for Pasture or Grazing	109,352	25,439 acres	85,414 acres
Woodland pastured	41,391 acres	61,210 acres	46,675 acres
Permanent Pastureland and Rangeland	101,550 acres	42,426 acres	106,132 acres
Pastureland, All Types	247,866 acres	98,771 acres	238,221 acres
Sum of All Grazing Livestock	130,879	78,686	108,828

Status of Resources

A. PRS[24]

NRCS' Performance Results System (PRS) is a consolidated reporting system of conservation activities. The following tables summarize conservation systems and practices planned and applied in the sub-basin for the designated time periods. PRS data, in conjunction with other information, are used to assess the current state of the resources in the sub-basin and past efforts to address resource concerns.

FY = Fiscal Year

PRS Data	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	Average per Year
Total Acres Conservation Systems Applied	16,487	25,852	23,946	22,265	Not reported by Hydrologic Unit (HU)	20,765	20,262	28,948	23,325

Figure 27. Conservation Practices Applied

Summary Conservation Practices (PRS Number)	FY 05	FY 06	FY 07
Access Road (560)		500 feet	
Brush Management (314)	326 acres		24 acres
Comprehensive Nutrient Management Plan (100)	126		1
Conservation Cover (327)	2,247 acres	1,143 acres	2,144 acres
Conservation Crop Rotation (328)	9,940 acres	11,263 acres	11,356 acres
Contour Farming (330)	474 acres	588 acres	90 acres
Critical Area Planting (342)		73 acres	13 acres
Diversion (362)	5,381 feet	400 feet	
Early Successional Habitat Development/Management (647)	244 acres	613 acres	1,042 acres
Fence (382)	117,680 feet	40,286 feet	49,965 feet
Field Border (386)	5,700 feet	3,700 feet	2,500 feet
Filter Strip (393)	116 acres	41 acres	11 acres
Forage Harvest Management (511)	1,012 acres	1,040 acres	2,841 acres
Forest Stand Improvement (666)	122 acres	98 acres	100 acres
Grade Stabilization Structure (410)	19	33	19
Grassed Waterway (412)	106 acres	14 acres	10 acres
Heavy Use Area Protection (561)	42 acres	12 acres	39 acres
Manure Transfer (634)		2	
Nutrient Management (590)	1,963 acres	283 acres	1,737 acres
Pasture and Hay Planting (512)	2,143 acres	3,073 acres	3,041 acres

Conservation Practices Applied (continued)

Summary Conservation Practices	FY 05	FY 06	FY 07
Pest Management (595)	1,278 acres	343 acres	2,287 acres
Pipeline (516)	14,490 feet	7,160 feet	14,320 feet
Prescribed Burning (338)	515 acres	106 acres	
Prescribed Grazing (528)	368 acres	1,069 acres	927 acres
Prescribed Grazing (528A)	1,350 acres	13 acres	97 acres
Residue and Tillage Management, Mulch Till (345)		7,884 acres	10,311 acres
Residue and Tillage Management, No-Till/Strip Till/ Direct Seed (329)		2,039 acres	2,522 acres
Residue Management, Mulch Till (329B)	6,369 acres	851 acres	42 acres
Residue Management, No-Till/Strip Till (329A)	2,701 acres		34 acres
Residue Management, Seasonal (344)	510 acres	818 acres	226 acres
Riparian Forest Buffer (391)	341 acres	122 acres	81 acres
Sediment Basin (350)	1	1	
TA Design (911)			205
Terrace (600)	101,883 feet	169,886 feet	109,500 feet
Tree/Shrub Establishment (612)	381 acres	118 acres	92 acres
Tree/Shrub Site Preparation (490)		3 acres	
Underground Outlet (620)	64,936 feet	62,460 feet	64,560 feet
Upland Wildlife Habitat Management (645)	1,911 acres	1,708 acres	2,645 acres
Use Exclusion (472)	2,238 acres	1,065 acres	1,783 acres
Waste Storage Facility (313)		1	
Water and Sediment Control Basin (638)	32	30	32
Watering Facility (614)	40	17	22
Wetland Enhancement (659)			147
Wetland Restoration (657)	51 acres	290 acres	392 acres
Wetland Wildlife Habitat Management (644)	191 acres	290 acres	56 acres

B. Watershed Projects[25,31,32,34,38]

In addition to conservation activities itemized for individual land units, state and Federal watershed programs contribute to the current state of resources. Past and current activities within this sub-basin are summarized in the table below.

Figure 28

319 Project Name	Status
Fox-Little Fox Watershed Protection Program	Active
Fox River Ecosystem Development Project	Active

PL-566 Project Name	Acres	Status
Big Wyacondah	36,102	Completed
Buck-Doe Run Creeks	30,918	Completed
Durgens Creek	44,855	Completed
Little Wyaconda-Sugar Creek (Amended)	73,277	Completed
North Wyacondah	22,309	Application

AgNPS SALT Project Name	Status
Little Fox Creek	Active

C. Farm Bill Program Lands[26]

USDA programs involving long-term contracts or long-term to permanent easements on land units allow for sustained conservation and restoration goals. In this sub-basin, the Conservation Reserve and Wetlands Reserve programs have considerable participation, as summarized in the table below.

Figure 29

Program	Number of Acres	Number of Contracts or Easements
Conservation Reserve Program (CRP)	62,252	1,831 contracts
Wetland Reserve Program (WRP)	3,808	29 easements

D. Conservation Opportunity Areas[27]

The Missouri Department of Conservation joined with resource partners to take an "all conservation" approach via a framework referred to as Conservation Opportunity Areas (COAs). COAs identify the best places where partners can combine technology, expertise and resources for all conservation, with such focused efforts providing enhanced results. Various future funding opportunities for resource projects will give priority to work addressing the conservation goals within COAs.

Stakeholder groups have been formed and resources profiles developed for thirty-three of the highest priority COAs in Missouri. The Bear-Wyaconda River sub-basin contains none of the profiles COAs in Missouri. Data similar to the Missouri COA project were not available for Iowa or Illinois.

E. Environmental Protection Agency Priority Watersheds[28,29]

The Environmental Protection Agency (EPA) has worked in conjunction with Iowa and Missouri Departments of Natural Resources to identify priority watersheds in each state. The prioritization process paid particular attention to those watersheds where there is a high potential to accomplish measurable water quality improvements in a relatively short time. The target watersheds are used to target requests for Clean Water Act 319 funds. The Bear-Wyaconda River sub-basin does not contain priority watersheds per this designation in Iowa or Missouri, and data for Illinois for not available.

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